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Edison's 80th Birthday.

EIGHTY years ago to-day, there was born Thomas Alva Edison—one of the most remarkable characters that have played their part on the stage of the world. Like so many other electrical pioneers, he entered the industry by way of the telegraph, at the age of 15, and has thus been associated with it for no less than 65 years. His latest biography (by no means the first), written by George S. Bryan,* opportunely reached our hands a month ago, and records in most readable fashion the fascinating story of his career—from newsboy to doyen of an industry whose capital value, largely due to his inventiveness, has been estimated at £3,000,000,000 in the United States alone.

Probably Edison is the most prolific inventor that the world has ever known; but unlike many an inventive genius, he made his profession pay. The number of his patents runs into thousands (already in 1910 they numbered 1,328), and some of them were extremely lucrative—yet he cared little for wealth. Hundreds of law-suits were fought in defence of his electric lamp patents, at enormous expense, but he said he "never enjoyed any benefits" from those patents. Few men have followed so many vocations, and with so much success: newsboy, printer and publisher, telegraph operator, telephone inventor, electric light and power engineer, moving-picture and phonograph inventor, manufacturer of lamps, dynamos, cement, storage batteries, and concrete houses—the versatility of his genius is astonishing. A devotee of research, which he prosecuted with an unprecedented intensity and comprehensiveness (10,000 experiments were made in the search for a substitute for the lead-acid accumulator, and 50,000 before final success was achieved), he invariably had a definite commercial aim in view and never embarked on scientific research for its own sake. His well-known saying that "genius is 1 per cent. inspiration and 99 per cent. perspiration" crystallises his views on this subject, though in its excessive modesty it is blatantly unjust to his own inexhaustible fertility of invention, his extraordinary insight into the possibilities of an idea. But he is far from scorning the labours of scientific men; he is an omnivorous

* "Edison: the Man and his Work." London: Alfred A. Knopf. Price 18s.

reader, and possesses the invaluable capacity of quickly absorbing information from books and storing it in a most retentive memory.

His greatest success, probably, was the development of the carbon-filament lamp, an efficient type of dynamo to supply it with current, and the feeder-and-main system of distribution, perfected by his invention of the three-wire system—the whole forming a complete equipment for the electric lighting of a town. The fact that other inventors, such as Swan and Hopkinson in this country, were working on parallel lines, in no way detracts from the credit due to Edison for establishing a system which in one city alone—Chicago—now employs generating plant of more than 1,000,000 kilowatts capacity and supplies electric light, heat, and power to a population of some four million souls. When he was in his prime, his industry was a consuming fire—but his physical constitution, happily, was equal to the strain. He possessed the faculty of inspiring his staff and employés with a large measure of his own impetuous eagerness to obtain results, and was no less distinguished by his qualities as a leader of men, than by his intuitive genius as an inventor—a rare, almost unique, combination.

Returning to Mr. Bryan's book, we heartily commend it to our readers as a most interesting and satisfying work, which will hold their attention from cover to cover; and we tender our congratulations to Mr. Edison not only on having so competent a biographer, but also—what is vastly more important to him— on his having the happiness to bring to fruition so many inventions for the use and benefit of man, and to know that his name is held in honour by every nation.

From his Laboratory at Orange, New Jersey, on the occasion of our Jubilee in 1922, Mr. Edison sent us a felicitously-worded message of congratulation; it is with the greatest pleasure that we now convey to him, on behalf of our readers as well as ourselves, the most cordial greetings on the eightieth anniversary of his birth.

High-pressure Cable Tests.

ACCORDING to a paper read before the American I.E.E. last year by Messrs. D. W. Roper and H. Halperin (of the Commonwealth Edison Co.), in the past the principal safeguard of the purchaser of electric cable has been the manufacturer's guarantee, since factory tests, in the case of cables operating at a normal voltage above 7.5 kV, were quite perfunctory; they served merely to eliminate sections of very defective workmanship, but failed to indicate the quality of the insulation, unless it happened to be very bad indeed.

Since 1920 nearly all American cable manufacturers have modified the impregnating compounds they used in an effort to minimise dielectric loss; during the same period some users demanded a reduction of the insulation thickness, which resulted in the dielectric stresses being increased. In a number of cases unwisely chosen compounds, and perhaps the insulating papers employed also, developed faults that were more serious than high dielectric loss; the dielectric strength of some cables proved to be deficient, while in others ionisation occurred. Consequently, when manufacturers in the United States about two years ago reduced their five-year guarantee period to two years, it became necessary to attempt to devise tests to be applied in the factory which would permit the purchaser to determine, before delivery of the cable, whether it would be likely to operate satisfactorily in service.

Notwithstanding test modifications, however, trouble continued, and an investigation was accordingly undertaken (correlating with the specifications and test results the operating experience of some 4,000,000 ft. of high-voltage, three-conductor, cable purchased from 10 manufacturers during the past six years) with the object of determining what changes should be made in cable specifications in order to reduce the number of service failures.

The results obtained indicate that the best cable is, in general, made by those manufacturers who exercise the best control over their processes, as shown by the uniformity of test results and inspection data. Laboratory work in this country has proved itself to be of the greatest value in the examination of materials and the checking of process operations in the factories, thus confirming in England the conclusions drawn above.

It may be remarked that Col. E. Mercier, in his recent I.E.E. paper, referring to the 60,000-V cable network in Paris, said that no dielectric acceptance tests were specified, because in his opinion they were useless as a guide to cable users. A good deal of light was thrown on the subject by Mr. Luigi Emanueli in the paper of which a translation appeared in the ELECTRICAL REVIEW for December 24th, 1926. The author's ingenious experiments were exceedingly interesting, and appear to afford a working hypothesis on which to base further improvements in the methods of manufacturing cable.

Local Exhibitions and the Public.

WE have always maintained that one of the best means of spreading the electrical idea is the local exhibition. While displays of a national character implant general impressions which may or may not be lasting, the local exhibition brings the present or prospective consumer into touch with local contractors and retailers; there is far more hope of doing business when the customer realises that the seller is within easy reach to give advice and service. The value of such exhibitions is, however, largely negatived if the exhibitors' representatives adopt a very superior, technical attitude, and if they are not very precise in their statements regarding the capabilities and costs of their appliances.

A lay correspondent has written at length upon this subject, after visiting a recent local exhibition, in the form of an electric home. He admits that the dwelling was admirably furnished and electrically equipped in a thorough manner, but he complains that the replies to his questions were of a very vague character. Apparently he would have been satisfied with a definite statement regarding the wattage of each appliance, but evidently he could not get this. He quotes an instance, concerning a water heater, in which the reply was actually misleading.

This is quite wrong; but from our own experience we know that it is not altogether unusual. We would go further than our correspondent and say that not only should the consumption be definitely stated, but also the actual cost of running should be given. At a local exhibition this is not difficult; in fact, it is very often done. But we should like to see the practice adopted generally. The public isn't interested in "watts" and other vague quantities. Its standard is £ s. d., and all exhibitors at local displays should conform to this standard.

The Electricity Board.

IN fulfilment of general expectations there was issued on Monday, on the eve of the re-assembly of Parliament, the official list of the seven gentlemen who have been appointed to be members of the Central Electricity Board, under the chairmanship of Sir Andrew Duncan. Their names and qualifications are published in our "Personal" column to-day. All we have time to say as we go to press, is that some anticipations have not been realised, that secrets have been well kept, and that the selections reflect on the whole a determination to secure men possessed of those special and varied kinds of experience essential to the elaboration and execution of a broad-minded and sound national policy and the bringing into harmony of diverse interests. Finance, industry, coal, electric power and electricity supply, all have their fully qualified representatives on the Board.

Electrical Developments at Gt. Yarmouth.—I.

The remodelling of the generating station, involving an entirely new boiler house and reconstruction of the turbine room for the installation of up-to-date plant for modern steaming and generating conditions.

THE official inauguration of the extensions at the South Denes generating station of the Great Yarmouth Corporation, which was to take place on Thursday of this week, marks an important stage in the development of the scheme for the reconstruction of the whole of the system of generation and distribution which was commenced a few years ago, and which is believed to be the largest change-over scheme yet sanctioned by the Electricity Commissioners.

The public supply of electricity at Yarmouth was begun in 1895. A scheme had been drawn up by the late Sir W. H. Preece, C.B., for the lighting of the borough, and the entire contract for the required generating plant was placed with Messrs. Crompton & Co., Ltd.

The original station plant had a total capacity of 150 kW, and consisted of two steam reciprocating sets, two 4,500-lb. Babcock & Wilcox boilers, and the necessary auxiliaries and switchgear. The supply was generated at 2,000 V, single-phase, and delivered to the consumers at 100 V. The original capital expenditure for the undertaking was £16,500.

Fig. 1.—New Boiler Plant at Yarmouth.

The capacity of the station was increased from time to time, and in 1920 the Corporation instructed Mr. A. H. Preece, of the firm of Messrs. Preece & Cardew, consulting engineers, to report on the condition of the undertaking, in view of the passing of the Electricity (Supply) Act of 1919, and the urgent need to bring the concern up to date. The total capacity of the works at that time was 2,300 kW, made up of eight sets, the largest being a 600-kW turbo-alternator, whilst the steaming capacity of the boilers was 56,000 lb. of steam per hour, delivered by ten units. The system of generation and supply was still single-phase at 83.5 cycles.

Mr. Preece advised the installation of plant for generating at 50 cycles, and a new 1,500-kW Brush-Ljungström turbo-alternator, 3-phase, 50 cycles, 3,850 V, was put into commission in 1921, together with a 500-kW rotary convertor and one 500-kW frequency changer.

In 1923 a second and similar 1,500-kW set was installed, and also a 1,000-kW frequency changer.

In 1924, as the result of a communication from the Electricity Commissioners, Mr. J. H. Rider, of Messrs. Preece, Cardew & Rider, was requested to report on the undertaking, with special reference to the advisability of changing the system of generation and distribution.

On the appointment in that year of Mr. P. G. Campling, A.M.I.E.E., as engineer and general manager of the Electricity Department, consequent on the death of the late borough electrical engineer, Mr. Gordon Bryant, the Corporation instructed him to prepare a scheme in accordance with Mr. Rider's report for the installation of a new boiler to meet the immediate requirements for the winter of 1925, and for the remodelling of the existing power station and distribution system to the standard system of general supply in accordance with the recommendations of the Electricity Commissioners.

After careful consideration of the existing site of the power station, with regard to the facilities offered for the supply of sea- or rail-borne coal and circulating water, a scheme was drawn up which involved the reconstruction of the generating plant so as to provide for an ultimate output of 40,000 kW. A lay-out was also prepared for a new e.h.p. and l.p. transmission system, in accordance with the desired change-over of the supply from single-phase, 83.5 cycles, to 3-phase, 50 cycles, 4 wire, including the provision of 11 new overground sub-stations. The proposals were adopted by the Corporation and involved an approximate expenditure of £243,000.

The reconstruction of the generating station is of unusual interest, involving some structural alterations of a somewhat delicate nature. The design of the old

station was on the parallel boiler and engine house lines, running east and west, with provision for extensions in the easterly direction. The remodelling reverses the order, and the new plant has been installed at the east end of the station so that additional plant can be put down towards the starting end on the sites of the old

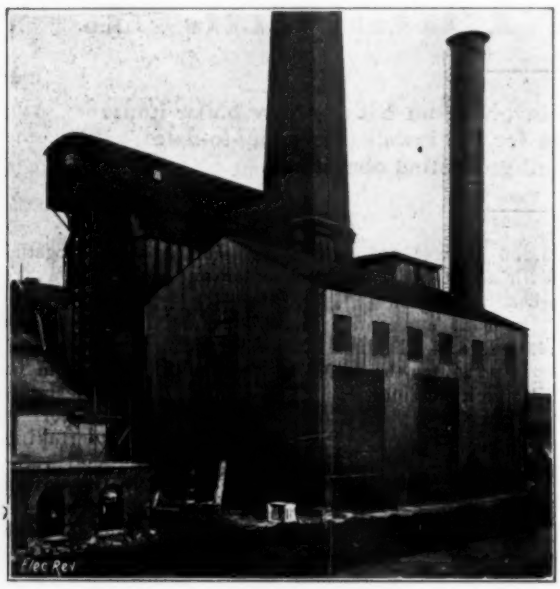


Fig. 2.—Boiler House and Coal Conveyor.

machines which have been or are being scrapped, thus avoiding that mixture of old and new equipment which is often the result of reconstruction schemes. The only portions of the old plant which are to remain are the two 1,500-kW turbine sets already referred to. These are shown in fig. 4, which gives a general view of the old turbine room looking west. The capacity of each of these machines is to be increased to 2,000 kW by the makers, who will take the turbine portions of the sets to their works and either recondition the existing blading or supply new to suit the new steaming conditions of the station. The alternators will be suitable for the increased output.

The development scheme has involved the provision of an entirely new boiler house, a steel-frame structure covered with Robertson sheeting, and increasing the width and height of the east end of the turbine room. These increased dimensions necessitated a new roof, some 7 ft. higher than the old one, with a different centre, the widening being effected on one side of the building only by including what was originally a wing for the station workshops. To effect this, some intricate underpinning of the foundations was essential, credit for which should be given to the Fawcett Construction Co., Ltd.

The new boiler house, fig. 1, at present accommodates two recently installed 30,000-lb. boilers, in addition to the 25,000-lb. boiler installed in 1925, and provision is made for the installation of a fourth unit. As already indicated, future extensions to the boiler house can easily be effected in a westerly direction. The boilers are all of the Babcock & Wilcox water-tube type, the two most recently installed being arranged with Green economisers in single units, and the other with separate economiser plant. The boilers each have a heating surface of between 6,000 and 7,000 sq. ft.; they are equipped with Diamond soot blowers and chain-grate stokers served by traversing coal shoots fed from overhead bunkers. The lower end of each shoot is carried to and fro from end to end of the coal hopper by means of a revolving coarsely-threaded shaft with which the shoot is engaged, thus ensuring a uniform mixture of the fuel used, nuts and fine coal, on the grate. A feature of interest is the grate drives for the 30,000-lb. boilers, a driving unit being employed which has only recently been introduced into this country by the makers of the plant. Each consist of a 4-speed motor-car type gearing driven by a 1-h.p. motor mounted on the apparatus, fig. 1. The drive to the stoker shaft is through a worm equipment, the whole running in an oil bath. The grate speeds range from 16 to 40 ft. per min.

The steaming conditions for the whole of the new equipment are 250 lb. per sq. in. g. and 700 deg. F. superheat. Forced and induced draught are provided for the two new boilers, the former by means of a motor-driven fan under each boiler, and the latter by a similar fan installed at the base of a new steel chimney, common to both boilers, the system being designed to give a maximum flexibility for dealing with low- or high-grade fuels on light or heavy loads The feed water is delivered by means of two Weir turbine pumps, each of 7,500 gals. per hr. capacity, from a hot tank into which the condensate from the turbine plant is fed.

The overhead coal bunkers have a total capacity of 450 tons, and are fed by a gravity bucket conveyor capable of handling 40 tons of fuel per hour, fig. 2. This is driven by an 8-h.p. motor, and travels at 48 ft. per min. The coal is raised from a receiving hopper on the ground level, an automatic filler allowing just sufficient coal to pass into each bucket without spillage.

The firing floor of the new boiler house has been arranged 12 ft. above the old floor, so as to enable a modern ash-handling system to be installed in the basement on the old level. The ash passes from the grates

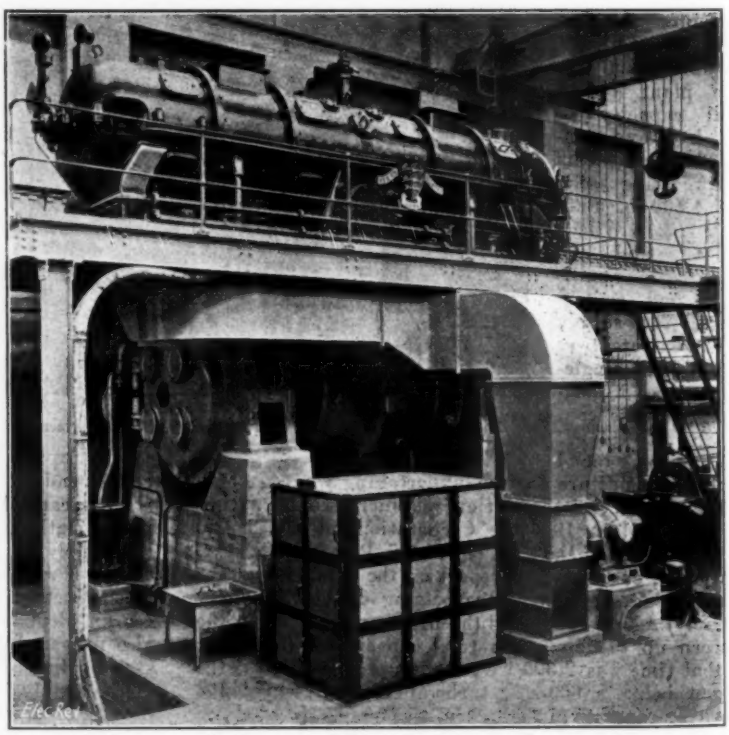


Fig. 3.—3,000-kW Turbo-alternator Plant.

into suitable hoppers, which are emptied as desired into tip wagons which run on rails to the dumping ground.

Arrangements are being made for the installation of a modern overhead coal-handling plant for transport-

ing fuel from vessels at the quay side to the works yard and to the receiving hopper. In this connection it is interesting to note that an old conveniently placed disused pond in the works yard is to be used as a pit for reclaiming the coal by means of the telpher grab.

The boiler equipment is completed by the provision of suitable overhead water tanks and hot wells. The lay-out generally has been designed to ensure the maximum efficiency and economy under all working conditions, and at the same time to afford complete accessibility to all working parts and so reduce the maintenance costs to the lowest possible limits. The whole of the plant, including the buildings above the firing floor, the boilers, coal bunkers, conveyors, mechanical stokers, and all the accessories was manufactured and installed by Messrs. Babcock & Wilcox, Ltd. All the foundation work for the buildings, bunkers and boilers, and the construction of the main flue, were executed by direct labour under the supervision of the engineer and manager.

In the reconstructed section of the turbine room, which is served by a 20-ton three-motor electrically driven overhead Morris crane, 50-ft. span, 120 ft. per min., is installed a 3,000-kW Brush-Ljungström turbo-alternator, fig. 3, of the double-rotation radial-flow type, 3-phase, 3,850 V, 50 cycles, 3,000 r.p.m., capable of a continuous overload of 25 per cent. The machine is mounted directly on its two-flow type surface condenser, which has a cooling surface of 3,000 sq. ft., and is capable of dealing with 32,250 lb. of exhaust steam per hour, maintaining a 28.5-in. vacuum. The air is extracted by a two-stage Brush-Delas ejector, with a dry-air capacity of 19.34 lb. per hr. The condensate is withdrawn by an electrically driven "Pulsometer" centrifugal pump capable of delivering 51,600 lb. of water per hour against a head of 57 ft.

The alternators are air cooled, a fan by Messrs. Standard & Oswald Stott, Ltd., being employed in conjunction with an oil-type air filter by the Premier Engineering Co. A novel feature of the turbo-alternator plant is a small steam turbine employed on the oil-circulation system. This is brought into operation automatically when the circulating pressure drops below a predetermined figure. The control is by means of a flexible diaphragm, which is normally balanced between equal steam and oil pressures on either side.

The cooling water for the condensers is delivered from the river through a 4-ft. gravity-flow pipe line to a sump where it is cleaned by two self-cleaning rotary strainers, made and installed by Messrs. F. W. Brackett & Co., Ltd., each capable of dealing with 800,000 gal. of water per hour. For the circulating water a new pump house accommodates two Mather & Platt vertical-spindle pumps, each having a delivering capacity of 5,280 gal. per min. The condenser discharges are connected to a common main leading into the river at a point below the low-water level, so as to obtain the benefit of siphonic action. Owing to the industrial difficulties of 1926, it has not been possible yet to complete the circulating-water system, and the cooling water for the new turbo-alternator is at present being obtained from the old cooling-tower equipment, a temporary sump having been installed. In this connection it is interesting to note that one of the 55-h.p. vertical-drive motors to be installed in the new pump house is running horizontally and driving a turbine pump in the temporary system.

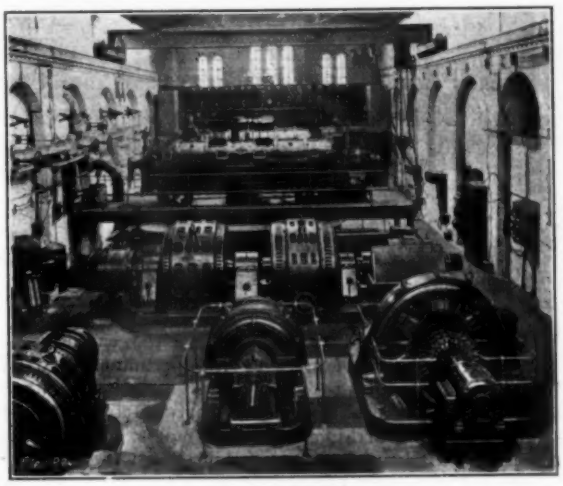


Fig. 4.—Old Turbine Room.

The extensions also include a 500-kW English Electric rotary convertor, with the necessary transformer equipment for receiving from the e.h.p. system, for supplying the tramway undertaking at 525/560 V. This machine is of the six-phase type, 1,500 r.p.m., and is fitted with special commutating poles and a centrifugal speed-limiting device. It is equipped with voltage-adjustment tappings, and provision is made for direct starting. The traction supply is dealt with by a 5-panel B.T.-H. switchboard

New e.h.p. switchgear, fig. 5, has been erected immediately over the switchboard, which was installed originally as the necessary medium between the 3-phase generators and the frequency changers. The latter board is to be used for the station auxiliaries. The new equipment is housed in ten stone cubicles, and is remotely operated, mechanically, from a 10-panel enamelled-slate board equipped with the necessary instruments, and Merz-Price protective gear for the alternators. A Brown Boveri voltage regulator and modern synchronising apparatus are also provided. The switchgear is of the English Electric oil-immersed type, the breakers having a rupturing capacity of 150,000-kVA. Duplicate busbars are provided, and in each case the phases are carried in separate chambers. Arrangements are made for the speed of the turbo-alternator to be controlled from the switchboard, motor-driven governor equipment being installed on the turbine.

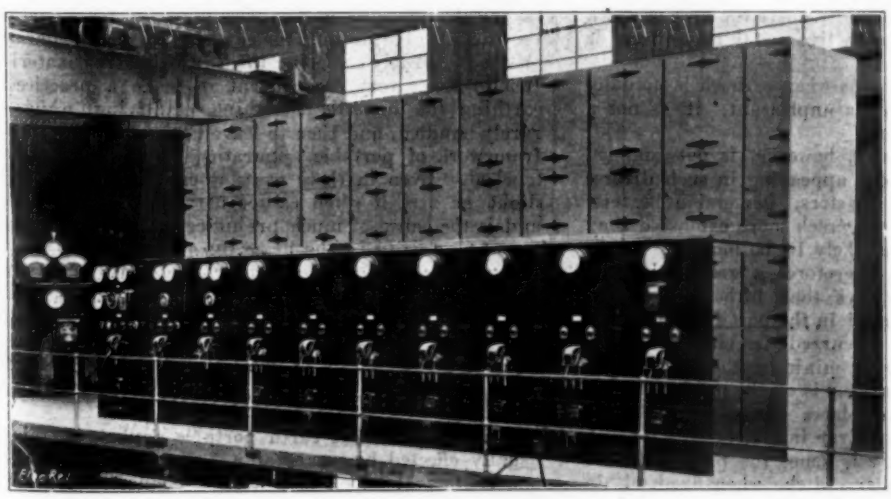


Fig. 5.—New e.h.p. Switchgear.

To meet the 1928 load, a 7,500-kW turbo-alternator and an additional boiler are to be installed.

The Earthing of Portable Domestic Appliances.

Many installation engineers regard the risk of shock as insufficient to justify the earthing of portable apparatus in the home; the danger is, however, in the author's opinion, a real one, and the cost of providing against it by using three-pin plugs and earthing wires is inconsiderable.

By R. H. RAWLL.

IT is not proposed to discuss here the earthing of the framework of more or less permanently fixed electrical apparatus, such as large radiators, wash boilers, geysers, cookers, &c. Fortunately, in those situations where earthing is essential (for example, bathrooms and kitchens), such appliances usually can be easily and efficiently earthed by means of a connection to a convenient water pipe. The earthing of portable apparatus obtaining its supply by means of a flexible cable and plug from a socket, however, does not present such a simple problem, and it is this aspect of the subject which is to be considered.

First of all, it will be perhaps helpful in approaching this subject to consider the reasons and necessity for earthing. It is, of course, well known that the chief reason is to ensure immunity from shock should metal other than conductors become charged. (Incidentally, on those systems of supply whereof one pole is permanently earthed, it fulfils, in addition, another useful function in calling attention to such leakage by the blowing of the fuse connected to the other pole, thus disconnecting the faulty apparatus.) Many persons, however, although they are fully aware of these reasons, do not consider the risk of shock sufficiently great to justify the earthing of portable apparatus in the home. Their argument is usually based on the facts that—

(1) The majority of portable apparatus, *e.g.*, radiators, vacuum cleaners, etc., are used in rooms with wood floors covered with carpets, where the risk of shock to earth, should contact with live metal take place, is practically nil, and

(2) On those rare occasions when a shock is actually experienced, although it is unpleasant, it is not a matter of great importance.

Portable apparatus to-day, however, is not confined to living rooms, and besides appearing in such diverse forms as shaving mugs, toasters, immersion heaters, etc., the numbers in use are much more extensive than a few years ago, and are likely to be more so in the near future. There is, therefore, a greater risk of shock in the home nowadays than hitherto. In the same way, shocks experienced in the past from portable apparatus have usually occurred in situations and under conditions tending to minimise their intensity; while to-day portable apparatus is on the market for use in bathrooms and similar places where a shock can easily be highly dangerous. Even in the old days the risk in the bathroom was realised, hence the provision of a shock-proof type of tumbler switch, when fixed within reach of an occupant of the bath. That this danger of obtaining a severe shock in such conditions is not an exaggeration is shown by the following incident, which occurred quite recently to a consumer of the supply undertaking of which the writer is a member of the staff. This particular individual placed a small immersion heater in a jug of water in the bathroom and then proceeded to have a bath. During his ablutions he observed the water in the jug boiling furiously, and being unable to reach the switch controlling the plug and socket to which the immersion heater was connected, he placed a sponge on top of the jug to prevent the water boiling over. A little while after he stepped out of the bath, and on picking up the sponge received the shock of his life (in more senses than one). The water in the sponge had penetrated the flexible lead at the connection to the immersion heater and rendered the whole thing alive. Considering that the shock was sufficient to throw him to the other side of the bathroom, it requires very little imagination to realise what would have happened had his body been in the bath when he made contact with the live metal. Some engineers are of the opinion that earthing such appliances is by no means a necessity, and in support of their argument point to America, where, although the use of electricity is considerably more extensive than in this country, it is not usual to earth portable domestic appliances; but it is often overlooked that the supply pressure in America for residential purposes is in most cases considerably lower than that prevailing in Great Britain, being in the region of 100 volts. It must also be borne in mind that the Government proposes standardising the pressure for domestic purposes at 230 volts, which, in respect of a.c. systems, in most cases will mean 312 volts to earth as regards intensity of shock. That the Home Office is fully aware of the risk of dangerous shock from portable electrical apparatus in factories is demonstrated by the very definite regulations for earthing all such apparatus or else completely enclosing them in insulating material. It also seems very inconsistent to make a practice of earthing the metallic sheathing of wiring, which is rarely handled, and then to leave unearthed the exposed framework of portable apparatus, which is frequently touched. Even in those cases where the shock is of a slight nature, it often causes nervousness to the user and is the cause of much prejudice against the further use of electricity in the home, on the score of its being "dangerous." In other words, the possibility of electric shocks in the home is a bad advertisement for electricity, particularly at a time like the present, when its use and advantages in the domestic sphere are being boomed. Thus from all points of view, besides that of safety, the earthing of portable apparatus is decidedly necessary.

If it is decided to earth portable apparatus, this is usually effected by means of a 3-pin plug and socket, one contact of which is efficiently connected to earth. The earth connection is made to the apparatus by means of an additional conductor incorporated in the flexible cable. It may be observed that when it is proposed to adopt the above procedure, it is often found that the manufacturer of the particular apparatus has not provided an earthing terminal. All electrical apparatus, whether portable or fixed, should be provided with an earthing terminal in case it should be required.

The cost of this additional item should be practically negligible. It is, of course, possible that with some makes of domestic apparatus the increased potential strain on the insulation, set up by deliberately connecting the framework to earth, would cause a breakdown, but this shows bad design and should not be tolerated as an excuse for not providing the necessary earthing terminal.

It has been already stated that the most likely place in the ordinary house where dangerous shocks may occur from portable appliances is the bathroom. But if a 3-pin plug and socket is fitted only in this position and the remaining plug points in the house are of the 2-pin type, several important disadvantages immediately present themselves. With such an arrangement, apparatus used in the bathroom cannot be utilised in the other rooms, and *vice versa*, on account of the non-interchangeability of the plugs and sockets. One method of getting over this trouble is to provide special apparatus for use in the bathroom only, but since this is obviously a most uneconomical proposition, it is usually ruled out of court at once. (This difficulty can, of course, be overcome by providing special 2-pin/3-pin plug and socket adaptors, but all will agree that such a solution is not an engineering job.) The writer has seen several contractors, when faced with this dilemma, install an ordinary 2-pin plug socket *outside* the bathroom door, and, on inquiring as to the purpose to which it will be put, has been informed that it is for use with portable apparatus in the corridor or on the landing only. In such cases the inevitable occurs. The consumer takes the unearthed appliance into the bathroom with the flexible cable trailing under the door to the socket fixed outside.

The writer's solution of this problem, which he knows is felt keenly by many engineers engaged in installation work, is to provide 3-pin plug sockets at all power points. The objections usually raised to this suggestion are: (1) the extra expense involved, and (2) the necessity of running a special earth wire or using only earthed metallically sheathed wiring or tubing throughout the installation, in order to provide the necessary earth connection at each plug socket. With regard to the first point, in a large number of cases the extra cost of providing 3-pin plugs and sockets is greatly exaggerated. The writer has carefully ascertained the prices of different makes of 3-pin plugs and sockets, compared with the 2-pin variety, and for the 15-ampere size the average extra cost is in the region of 4s., the figure for smaller current-carrying capacities being proportionately less. Added to this, of course, is a small amount to cover the provision of the earthing connection. The labour involved in fixing a 3-pin plug-socket is practically the same as that required for the 2-pin type. The cost of installing four or five power plug points (which are the requirements of the average house) would, therefore, not be increased by much more than £1. Thus, it can hardly be said that undue expense rules out the provision of 3-pin plug sockets. With regard to the other objection, provided lead-covered wiring, or other wiring enclosed in steel conduit, is used throughout the installation, the necessary earth connection, of course, does not present any difficulty. But, even if C.T.S. or v.i.r. in capping and casing is utilised for the wiring, and although 3-pin plug sockets are fitted at all points, it will only be necessary to make earth connections in such places where danger of shock to earth exists; and since these positions are usually in the bathroom, kitchen, or scullery, a neighbouring cold-water pipe generally provides the necessary earth connection It may be objected that to provide 3-pin plug sockets in rooms where the third pin is not earthed is to create a sense of false protection. But in a living room with wood floors covered with carpets, even if the frame of a portable appliance becomes alive, the risk of shock is negligible. But directly the same faulty piece of apparatus is plugged-in at a point where a dangerous contact to earth prevails, the third pin, in this case being earthed, causes the circuit-fuse to blow, and calls attention to the fact that some fault must be present.

It is hoped that these few notes may arouse interest in a subject which hitherto has received very little serious attention, and has been shelved by the majority of installation engineers.

The Trials and Humours of an Estimating Department.

By "ONE OF THEM."

THE engineer in charge of the estimating department of any firm manufacturing all classes of high- and low-voltage switchboards and motor-starting gear does not fill a post which, by any stretch of the imagination, can be called a sinecure. Neither, in general, is it lucrative when one considers the years of study necessary before one can satisfactorily fill such a position. Gone are the posts which, in return for votes, and without work or responsibility attached to them, were filled by Robert Walpole and others regardless of the remuneration. Your engineer cannot be included in the category covered by Walpole's dictum that "Every man has his price." He has a price in the opposite sense, in return for which he ploughs his way through good and bad, clear and vague, and (in the case of foreign correspondence) wretchedly translated inquiries. He is assailed on all sides and at all inconvenient times—directors want him (three at once occasionally), and simultaneously he is called up on the telephone to be given an inquiry now by a good customer and again by a firm which in 20 years has sent multitudinous inquiries, but has never screwed up enough courage to send an order, although in every case it has had "hopes." Bearing in mind all this and other innumerable worries which occur during office hours, it is no wonder that the engineer in question, sitting by the fireside in the evening, and turning to Dickens for a tonic, feels rather envious of, and impatient with, Micawber, who, lucky man, was always waiting for something to turn up.

The good people who send the inquiries seem to conspire to upset your engineer's equanimity at the beginning of each new day, although, taken as a whole, a little dry humour shows itself from time to time. The following examples, taken at random from a large number, will illustrate the funny side of the business:—

(1) "Can you let me have a price for a liquid starter for 185 kVA?"

(2) Extract from lengthy and verbose specification

sent out by an eminent consulting engineer: "The star-delta starters must be so arranged that, with the handle in the 'starting' position, the motor windings are connected in 'star,' and in the 'running' position in delta'"!

(3) Further extract from the same specification:—"The starters are to be packed for shipment with a view to preventing breakage in transit."

(4) "The whole of the switchgear, when erected, must be given three coats of *navel* paint."

(5) Conversation following the submission of a quotation for an alternating-current switchboard, embodying moving iron instruments, in response to inquiry specifying moving-coil shunted instruments:—

A: "I specified moving-coil instruments."

B: "Just so."

A: "But you have allowed for moving iron."

B: "Quite so, but the instruments you mention will not indicate on an a.c. circuit."

A (getting excited): "That's all right, but you have the same heating effect."

(6) An inquiry is received for a switch-panel for use with a 3-wire generator, 400 kW, 500 V d.c., and 800-ampere gear is specified in quotation. The inquirers receive quotation and 'phone to say that we have allowed gear twice as big as we should have done. Upon asking the reason for their criticism, we are told that, as the scheme is three-wire, the current will divide equally between the two outers, therefore 400-ampere gear should be specified!

And so on.

It is no exaggeration to state that if, in the inquiry stage, a full and lucid statement were given as to actual requirements and the conditions under which the gear in question would have to work, the pressure on the staffs of estimating departments would be reduced by 25 per cent. Take one instance of this kind. What is the good of sending an inquiry for a switchboard for controlling 3-wire d.c. generators running in parallel if no indication is given whether the machines are shunt or compound wound and, if the latter, whether there are split- or single-series windings?

Quality *versus* Price.

By ROBERT MARSDEN, M.M.A.E.

WHAT does the average buyer of electrical plant term a fair price? First of all it is essential to place your buyer under one of three headings:—(1) The purchaser with limited means—nowadays the most common; (2) the engineer of a concern who must not exceed a certain sum for his plant; (3) the "specification" man. Generally speaking, the last two types are easily dispensed with as knowing exactly what they want, they also know within a small margin what they are going to pay, and therefore do not present any real difficulty when you are called upon to meet their requirements. Therefore, we are left with the limited means man—invariably a difficult proposition.

As is often the case, it is assumed that he knows very little regarding electrical equipment. In 50 per cent. of these cases you receive a letter containing the sentence: "The equipment is required to drive a 'so-and-so' machine. Please quote your lowest price and best delivery." No particulars of speeds, horse power, pulleys, type of control, &c., are included. Unless it is a well-known machine, the details have to be obtained either by further correspondence (the worst method by far) or by a personal visit. The latter, if at all possible, is by far the better way, for it is impossible to gauge the personality and type of buyer from the letter heading of to-day. If you visit a man, you can show your interest in the problem in a practical way, and often decide everything on site. If you do not get in direct touch, it not uncommonly happens that you lose the order. This particular type of buyer has spent £500 on a machine and invariably wants it to be driven for about £25. In the design of present-day machinery particular features are incorporated, and probably to ensure real service the type of equipment required costs £50. These are days of severe competition, insomuch that it is possible with such a buyer for someone to come along with no reputation to lose and give him his £25 equipment.

What happens?

The thing is unsatisfactory. It repeatedly breaks down, and the buyer loses output: often the very features for which the machine was bought are lost, and last, but by no means least, the *machine operator loses faith in the electrical equipment, and his fears prevent both good work and output.* Therefore, you and the buyer are faced with the argument:—Quality *versus* Price. You know, but the buyer does not, the quality of the goods offered for the job, and if the buyer's price is £40 and your estimate £60, tell him the complete reason for the necessary extra £20? Here is a practical instance: To drive a certain flat-bed printing press, a buyer purchased a drum-controller equipment for £40 and it gave him excellent service. The same buyer was again in the market with a similar press to drive, but this time with an automatic feeder (for the paper); he wanted to run the press at top speed and output. He was quoted, correctly, a push-button control (start, stop, and inch) equipment, which is essential for giving the additional service required, for £60. The estimate was duly received, and it was read and scrapped immediately. *The estimate was not fully explanatory, and the buyer assumed it an unnecessary extravagance.* Without further consultation, he ordered a hand-operated controller elsewhere and suffered in consequence. You cannot blame the buyer for passing over your estimate under the circumstances, and, further, you are not respecting the confidence placed in you if you neglect to state fully why you put forward special features; once again, whilst B.E.S. Specification, 1923, stands electrically for a great deal, it conveys insufficient to the "man-in-the-street" buyer. Therefore tell him the MECHANICAL DETAILS of your design! Any machinery man will appreciate these point. You should see that he gets to know them.

Tell him how they are put together, and stop talking too electrically if your man is "at sea." If you must, and it is necessary at times, then make mechanical analogies. It pays, and you make a friend as well.

Electricity in French Mines.

The French mining regulations require that authorisation must be secured from the French Bureau of Mines for the use of electrical equipment underground in collieries. This has proved easy in the case of mines producing little gas, but quite impossible where they produce a great deal of gas. It is understood, however, that new regulations are now being formulated by the Bureau of Mines, and that they will be more liberal regarding the use of electrical equipment underground.

Rural Electrification and Agriculture.

Electric ploughing is the largest and most remunerative application of electric power in agricultural operations; the development of a suitable electrically-driven tractor for the purpose is the pressing need of the day.

By Major ANDREW McDOWALL, of Mungoswells.

THERE are to-day, broadly speaking, two new developments in the agricultural world—first, the application of electric power to land tillage, the driving of farm machinery, and the encouragement of plant growth; and secondly, the development of sugar-beet as a farm crop. The latter, owing to the subsidy, has for the present become the best, and, in fact, the only paying crop grown in our arable districts, and for this reason sugar-beet may be said to overshadow mean-time rural electrification; but let us remember that the beet industry is drawing in subsidy over £23 per ton of sugar produced, and that the State payments will steadily decrease, when it will be self-evident that the present boom is entirely artificial and that in reality the healthiest movement in present-day farming is the possibility which the Electricity (Supply) Act gives us of supplying our countryside broadcast with cheap power. It is only common sense to suggest that the development of machinery which will allow the ploughman to use this power should be pushed on, and thus with less physical labour to himself the ploughman may increase his daily output by 300 or 400 per cent. At present experiments have made it clear that electrically-driven ploughs can be profitably used. There is, however, a mild controversy as to the method of application, and by a coincidence the writer stumbled the other day on an article in the *Illustrated London News* of 1858, when the same problem was being discussed in connection with the application of steam to land cultivation. Each side then, as now, had its champions, and as all the world knows, the wire-winding sets, in spite of all the cumbrous and expensive gear involved, won the day.

What interests us now is the reason why the wire-winders established their undoubted superiority. It was found that the equipment employing the farm pressure steam of those days, and carrying with it boiler, water, and the heavy wheels necessary for firm grip, was (owing to the weight) almost impossible to manœuvre on land, except when the soil was in a dry condition; also that the coming and going of the engine across the field compressed and churned up the land to such an extent that the mechanical texture of the soil was affected, and the whole scheme of direct haulage was a failure. The wire-winder then carried the day, and as a mechanical method of power tillage reigned without question till the paraffin tractor showed that light, direct-haulage machines could with ease and profit be used on the land without damage to the soil.

This, then, is the position when we are promised a cheap supply of electric power in our rural areas, and the engineers are now making inquiry as to what can be done with their power when we get it in the farmyard. Their inquiries so far have not been too encouraging—a threshing mill running perhaps two days per week, a corn-crusher perhaps one half day, and a few small odds and ends are all they can see, and therefore they tell the farmer his load is unattractive, his line will cost him perhaps £400 per mile to connect up, and his power units will cost perhaps 3d. when delivered, and if the farmer's land is not right astride the power line he decides to let well or ill alone.

What the power engineer forgets to look at on his farm visits is the four or five pairs of horses filing away from the water trough and the tractor men placidly filling endless oil cans with which to stimulate their iron horses in their daily toil.

Why the engineer takes so little interest in this side of farm work it is difficult to say. Clearly in his student days he has been educated to look on anything outside a factory and off a tramway rail as quite outside the scope of his work. I know myself that, had I taken the advice of some well-meaning and senior professors, I would never have moved in electrical-tractor design, far less the actual construction of a tractor for land work.

Engineers unacquainted with the land make the mistake of looking at the farmer's engine shed as his power house, whereas it is only a convenience. The real power house is the stable, and it is only by bagging the tillage load from the horse that they can hope to give the much-talked-of cheap power; further, it is by tackling tillage work that the farmer will most substantially benefit from electric power.

Engineers should firmly grasp the fact that it is the ploughman with his single-furrow, horse-drawn plough that puts up costs to the arable farmer, and that the difference between the actual driving of a mill or milking machine by oil engine or electric motor is a very trifling affair, which will hardly be noticeable on the farm balance-sheet.

By this statement it is not intended to question the superiority of the electrical drive—there is no question about that—but no farmer will spend much on a connecting line if the total result is to be the scrapping of his present oil engine and the small saving he can hope for by the change-over.

When the farmer is convinced that by using electric power he can save substantially in his tillage department, then the whole position is changed. The power company will be as anxious to build the line and secure the increased load as the farmer will be to have it, and once the reliable, ever-ready electric drive is experienced, it will be only a question of a little time before the oil engines are weeded out and electrically replaced. The question of the day, therefore, resolves itself into the development of a suitable tractor. Early in 1923 the writer tried to impress this fact on the authorities in Whitehall and elsewhere; the suggestion, however, was before its time, and as there was then no sign of a State-aided rural-electrification scheme, no encouragement was given. I had, therefore, to carry on as best I could with the construction of a tractor which it was believed would link up our oldest and youngest industries and be of substantial benefit to both.

In considering tractor design, the question of the direct haulage of ploughs or indirect (by means of wire winding) first presented itself, and as a tractor carrying an electric motor can be built light, strong, and at

moderate expense, the temptation to use it in place of the wire winder, with its accompanying expensive and cumbrous gear, became irresistible. On the other hand, the difficulty of feeding a direct-haulage tractor, which must move freely about any irregular field and must not by any chance get entangled with its cable, seemed almost insurmountable.

It became clear that to solve this problem of feeding a radically new type of tractor would require to be designed, and this, after much delay, was finally achieved.

Continental experiments conclusively proved that to attempt to feed a tractor, moving round a rectangular block, by means of a trailing cable could only lead to trouble with the cable and danger to the attendant: this old-established method of rectangular working was therefore scrapped as impracticable, and it was decided that, as ploughing should be done in straight parallel lines, and as a trailing feeder cable can also only be safely handled in straight-line work parallel to the ploughing, these two circumstances should be combined, when a really foolproof and simple method of feeding at once emerges. This tillage scheme has already been ably described in detail by Mr. R. Borlase Matthews in the ELECTRICAL REVIEW, July 2nd, 1926, p. 4, and nothing further is necessary here, but the advantages of this system of tractor feeding over the wire winder are not yet fully appreciated.

First, in the matter of expense, the wire-winding equipment will probably cost four times as much as a direct-haulage tractor. Wire-winders, again, will require a minimum of three, and probably four, men to operate, when the direct tractor requires but one. Depreciation will be heavy with wire-winding and light with direct haulage. The feeding of the direct-haulage plant from one point half-way down the furrow is infinitely easier than the two-point feeder scheme required by the best wire winders, and, in addition, feeding should never be done from the furrow ends, as there are other duties to be carried out there, such as picking up the new alignment, bringing the new plough into work, &c., which fully engage the attendant's time and attention. By the half-way, single-point, direct-feeding system, automatic movement of the feeder point is obtained, requiring only general supervision by the attendant and at a time when he is not engaged with other duties.

There is another advantage which electric tractors will have over all rivals. It will be possible (so reliable is the motor and its power supply) to pay the ploughman by results.

If a farmer attempted this with horse teams they would at once wear thin under the pressure, and the men would plough light to ease their sorrows. Paraffin tractors are too unreliable for piece work, and if it is attempted, the tendency is to race the tractor, plough a light furrow, generally scamp the job, and ruin the machine. With a well designed electrical machine, on the other hand, the motor has practically one speed and will run at that speed whether light or heavy loads are taken. In consequence, the ploughman gains nothing by light ploughing, and it is impossible for him to damage the equipment by over-speeding. Also, as the driver has heat and light, as well as power at his command, it becomes possible in good weather to work double shifts, and thus escape from that most fatal predicament of the horse farmer—being behind with his work and unable, when a favourable spell of weather presents itself, to jump on the job which, if timorously done, will mean success, and if delayed may mean failure of the crop.

In addition to the tillage and barn-machinery loads, the farmer with cheap power at his elbow will seek other methods of using it, and it is anticipated that a grinding load will soon develop. Well-built grinders and meal mills can now be obtained at reasonable cost, and farmers will soon learn the advantages of purchasing (through their unions) phosphate rock, lime, and other such materials in bulk, and grinding at home when time permits. It is, in fact, difficult to see the end of electrical developments in rural areas, but our distribution engineers must develop their system and supply cheap farm lines and cheap power.

The Commissioners and supervising officials have arrived early on the scene, and have duly justified their necessity by passing regulations and restrictions which have a crippling effect on distribution schemes and generally block progress. We well know what is going on in other countries where successful electrification is carried out. We have to stand the competition of those countries in our home markets, and clearly it is the duty of the Commissioners to bring us into step with our more progressive neighbours.

The payment of our national debts and the expense of providing, free of charge, a market for the competing goods of our foreign competitors are surely a sufficient handicap without the maintenance of a set of regulations, which practice in other countries has proved to be not only unnecessary, but unreasonable. Let the Commissioners and supply companies remember that the agricultural demand for electric power and equipment may in the not distant future be their best market, and that agriculturists will much prefer a roughish power line to a ragged balance-sheet.

New Electrical Devices, Fittings and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

An Electric Carpet Washer.

An interesting electrical introduction to this country by MESSRS. S. G. LEACH & CO., LTD., 26-30, Artillery Lane, London, E.C.1, is the Hamilton Beach carpet washer. As the machine is moved forward over the carpet an action similar to that of the human hand is produced, and two sponge-rubber brushes, rotating at 500 times a minute, scrub the sud of a special compound, H-B, into the fibres of the rug, and the dirt and grease in the carpet are instantly, it is claimed, dissolved. An ingenious semi-squeegee device prevents the solution from spreading, and the whole of the moisture is suctioned back into the receiver pan. Finally, a brush lifts and straightens the nap.

Electric Wax Baths.

The Ingleby electric paraffin wax bath, made by INGLEBY MOTORS, Sweet Street, Leeds, has been installed in various hospitals and institutions throughout the United Kingdom for the treatment of neuritis, rheumatism and other complaints. Results of observations and tests have proved, it is claimed, that the apparatus has considerable healing value in itself, and is also useful as a preliminary for massage and other treatment. It is manufactured in three different types, large horizontal and vertical, and a small horizontal model for local treatment. Some designs are of white glazed fireclay, while others are of white enamelled iron, and all are fitted with self-contained heating apparatus and switches to control the temperature. The baths are wired up in the usual way from a plug or terminal box to a switch panel equipped with an ammeter, d.p. switch and fuses, and are designed for working at pressures of 200/220 V, a.c. or d.c.

A Three-Light Automobile Lamp.

Of particular interest to those interested in motor-car lighting is a 3-light electric lamp, fig. 1, which has recently been put on the market by the RUNBAKEN MAGNETO CO., Tipping Street, Ardwick, Manchester. A main spotlight lamp, which, it is claimed, throws a quarter-mile beam, is supplied from

the car lighting system, and in addition are an auxiliary lamp and a red rear lamp. The auxiliary is intended to serve in the case of breakdown or during ordinary garage repair work, when the apparatus is used as a portable lamp and the additional bulb is supplied from a small 2-V battery contained in the case. The auxiliary can also be used as a "see-you-home" in the event of failure of the main lamp or the lighting system, and can be fed either from the main supply or from the battery. The rear light is intended for use during

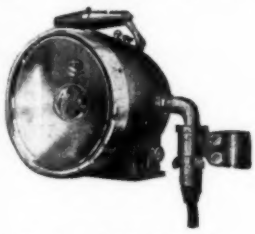


Fig. 1.—3-Light Automobile Lamp.

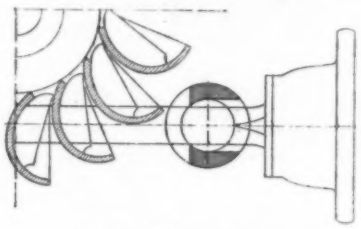


Fig. 2.—Deflector Diagram; Full-load Position.

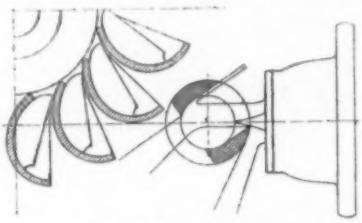


Fig. 3.—Position of Deflector at No Load.

parking, and is also supplied from the auxiliary battery. This lamp is exposed when a driving mirror at the back of the lamp is removed. When the mirror is replaced the locking device automatically switches off the light. A combined spot-light switch and charging indicator can be supplied for fitting to the dashboard. The lamp and its accessories are of nickel-plate finish.

An Electric Washer Combination.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, is shortly placing on the market a new electrical domestic machine, the "Magnet" Wizard, fig. 4, which appears to be a distinct variation from the electrical domestic appliance being sold at present. Essentially it is a machine for washing and wringing clothes, but it will also perform several other important functions. Arrangements are

Fig. 4.—The "Magnet" Wizard.

made for the easy interchange of parts, and by the simple turning of a switch the machine can be used to make sausages and ice-cream, to mince meat and vegetables, and to clean and sharpen knives. The necessary apparatus for performing each separate function is attached to the general driving shaft, one motor being employed for all the operations. A plug-and-socket device is provided for taking the supply from the mains. The machine is compact in design, occupying little space, and entailing very little supervision. The manufacturers claim that it costs very little to run, and can be handled with safety even by a child.

The Pitman Water Turbine Regulator.

The cheap, reliable and automatic governing of water turbines is a matter of some importance, particularly in the case of small installations. An ingeniously simple deflector regulator has been designed by MR. PERCY PITMAN, 25, Victoria Street, Westminster, London, S.W.1, to maintain constant speed on the impulse turbine at all loads, so that the turbine may be allowed to run continually without attention; the device is strongly constructed, becomes fully operative a few seconds after the main water supply has been turned on, and is said to enable a battery of storage cells to be dispensed with entirely in the case of a hydro-electric installation. The essence of the Pitman regulator, which is adaptable to existing water turbines, is a deflector; its various ports are so proportioned as to make the reactions of the two streams on the deflector equal and opposite, the deflector being in equilibrium at all positions. The power required to actuate it is thus very small, and any type of standard centrifugal or oil-pressure governor can be used to operate it; moreover, the deflector can be designed for practically any size of plant, even down to a 1/20-h.p. set. The accompanying diagrams, figs. 2 and 3, are self-explanatory: the deflector is arranged directly in front of the nozzle and embraces the jet, instead of being located above or below it; the water passage through the deflector being slightly constricted towards the outlet end, allows for instant action to take place on all load changes, however small. Fig. 3 indicates diagrammatically the position of the regulator when the whole load is suddenly thrown off the turbine, the deflector having been rotated by the automatic governor gear, diverting the whole of the jet of water momentarily from the wheel buckets. When economy of water is of great importance, the needle valve for reducing the flow of water can be interconnected with the deflector in order to permit of the whole or any portion of the load being instantly cut off without increasing the pressure in the pipe line. A master patent protects the deflector arrangement in this country and abroad. It has been tested at all jet diameters, we understand, with the following results: the normal speed of the turbine was 9 r.p.m.; when the whole load was suddenly thrown off, the speed of the machine did not rise above 926 r.p.m., or approximately 3 per cent. speed rise; no hunting was noticeable during the trials. Messrs. G. E. Milner & Co., Ltd., are the sole licensees for the granting of licences.

The "Emvee" Cord-grip.

The latest addition to the "Emvee" range of wiring requisites made by METRO-VICK SUPPPLIES, LTD., Trafford Park, Manchester, is a special ceiling plate and cord-grip. The plate, while of handsome appearance, possesses no new features, but the cord-grip is a novel device. It is made of non-inflammable moulded insulating material, and is in two parts, as seen in fig. 5. The wiring of the device is very simple. The flexible is threaded through the cord-grip and connected to the porce-

Fig. 5.—The "Emvee" Cord-grip.

Fig. 6—Ceiling-plate and Cord-grip.

Fig. 7.—The Cord-grip in use.

lain in the usual way. The two leads are then opened out and the screw plug is inserted and tightened up with a screw-driver. There is no risk of short-circuiting, as the leads are kept well apart at the point of entry. It is claimed that the grip will sustain a weight of 56 lb. Fig. 7 shows the appearance of the finished job, while fig. 6 shows the application of the device to one of the company's ceiling plates.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Campaign Notes, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The E.D.A.-E.L.M.A. Campaign.

The official report of the Campaign for the week ended February 5th states that electric demonstration houses were opened at Exeter and Hendon. Demonstration houses were to be opened during the current week at Glasgow (2), Birmingham, and Carlisle, and on February 22nd and March 2nd similar houses will be opened at Durham and Chesterfield respectively. Further houses will be opened shortly at Bath and Newcastle-on-Tyne. At Cardiff Messrs. Warden and Co. intend to run an all-electric house in conjunction with the Better Housing and Housekeeping Exhibition, which will be opened on February 22nd. The first Glasgow demonstration house attracted 6,476 visitors during the fortnight, and good attendances are reported from Walsall, Bishop Auckland, and the Denton House, near Manchester. The chairman of Bramhill Urban District Council has offered one of his own houses for demonstration purposes, and at Blackpool a five-roomed bungalow, electrically equipped, has been organised in connection with the *Blackpool Times* Health, Home and Fashion Exhibition. Glasgow Corporation Electricity Department showroom has taken 9,000 competition books. The travelling model house organised by the Birmingham Circle is doing excellent work, and was used at Wolverhampton during the exhibition period. The North-East Coast area reports increasing interest in the Campaign. This is being stimulated in some places by the children's competition. At Greenock a Campaign whist drive is being held on February 25th. A district officer for the Nottingham district states that, from experience to date, he is informed that on an average 75 per cent. of the visitors may be looked upon as potential consumers. The chairman of the North-West area has circularised a large number of supply engineers with a view to setting up more circles. The number of visitors attending the Wembley house has reached 600 per day, and not per week, as has been previously and incorrectly reported. The exhibition held at Wolverhampton attracted over 6,000 people in three days, and 3,000 people visited the exhibition held at Hampstead. An electrical exhibition was opened on February 7th at Falkirk, and the South Wales Electric Supply Power Co. will open an exhibition in Halesowen on February 14th.

In our last issue we reported that an exhibition in connection with the Campaign had been held at Wolverhampton. We are now able to reproduce a view of the display,

The Wolverhampton Electrical Exhibition.

which was held at the Public Baths. It will be seen that a wide variety of appliances was open to public inspection, including several types of fires, cookers, vacuum cleaners, wash boilers, and smaller devices. One section of the exhibition was arranged as a model bathroom, complete with electric geyser, towel rail, fire, shaving pot, and other articles. Members of the Electrical Association for Women paid an official visit to the show.

The "all-electric" house at Muirend, Glasgow, was visited by 6,500 people during the fortnight it was open. Two further "all-electric" houses at Shawlands, which have been arranged by the various local electrical interests in connection with the Campaign, were opened on February 7th and will close on February 19th.

The Exeter District Electrical Circle has opened a demonstration electric house, and it will be kept open until February 18th. The General Electric Co., Ltd., has supplied the complete equipment of the house, compriaing "G.E.C." fittings and "Magnet" domestic appliances, and has provided a demonstrator. Mr. A. H. Brooking, of Messrs. Brooking Bros., electrical contractors, Exeter, is acting as secretary to the circle.

The front page of "Home Lighting News," No. 7, bears a map of Great Britain, upon which are marked the localities in which circles have been formed (109). Another feature of the issue is an illustration, plan, and details of the February campaign window display. The back page contains illustrations of six typical demonstration houses, giving particulars of attendance and expenses.

An Electricity Committee and Dutch Cables.

We reported in our last issue that the Salford Electricity Committee had proposed that all its members should proceed to Holland to investigate wages and conditions in the Dutch cable-making industry. At last week's meeting of the Council, however, the chairman of the Committee (Alderman Billington) withdrew the recommendation, explaining that, although he was in favour of a direct investigation, it would be sufficient for the chairman, deputy-chairman, and the engineer to pay a visit to Holland. A councillor suggested that all the required information could be obtained from the appropriate Government department.

Floodlighting for Night Work.

It will be recalled that the grand stand on Epsom Downs was destroyed by fire last year, and it was decided to proceed immediately with the erection of a new and larger structure to take its place. The coal dispute interfered with the progress of the work, and it became apparent that in order to have the new stand ready by Derby Day in June next it would be necessary to carry on at night. Accordingly the electrical contractors, Messrs. Bell Bros., Cannon Street, E.C., arranged with the British Thomson-Houston Co., Ltd., to resort to floodlighting at night. For this purpose 16 16 "B.T.-H." Type 786 floodlight projectors with diffusing mirror reflectors and 1,000-W "Mazda" lamps were mounted on eight masts ranging in height from 10 to 40 ft., erected at suitable points around the site. It is claimed that almost daylight conditions are thus obtained and that the work proceeds as well by night as by day.

Something similar has recently been done at Weston-super-Mare, where the town authorities are engaged on a scheme to lock the tidewater at Glentworth Bay, and so enable visitors to have the benefit of tidal water at all times of the day. It was necessary to proceed with the work between tides at all times of the day and night. Messrs. Nott, Brodie & Co., the contractors, consulted the General Electric Co., Ltd., upon the matter, and the result has been the installation of a number of "G.E.C." floodlight projectors equipped with 1,000-W "Osram" lamps, which now provide adequate illumination for the carrying out of the work through the night.

The Wholesalers' Dinner.

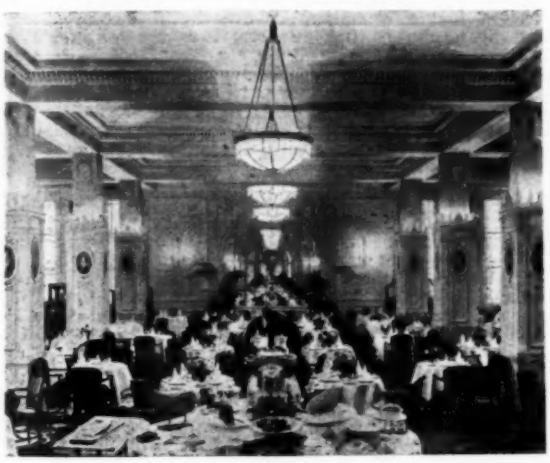
The annual dinner of the Electrical Wholesalers' Federation is to be held on February 24th. A number of prominent men have promised to attend, including Sir Andrew Duncan, the Chairman of the Central Electricity Board, Viscount Peel, and Col. Moore-Brabazon.

Paint Industry Amalgamation.

Messrs. Pinchin, Johnson & Co., Ltd., have entered into an agreement with Messrs. Docker Bros. whereby the two businesses will be associated.

Modern Restaurant Lighting.

The Café Verrey, Regent Street, W., has recently been rebuilt, and the opportunity was taken to equip the building with a thoroughly up-to-date lighting installation. The effectiveness of this can be gauged from our illustration of the main restaurant. The decoration in this hall is carried out on "Empire" lines, and the principal illumination is provided by three centrally-suspended ceiling fittings equipped with 36-in. cut glass bowls surrounded by hand-painted silk valances. A number of wall brackets supplement these and give high-intensity but, at the same time, softly-diffused illumination. Another large apartment, the ball room, is equipped with seven massive mahogany fittings, 36 in. in diameter, supporting hand-painted silk shades. Mahogany wall brackets in consonance with the main fittings are also installed. The banqueting hall has for its main lighting



The Café Verrey, Regent Street, W.

seven 20-in. diameter cut-glass bowls, each fitting having four arms which carry smaller lamps. In the entrance lounge are 12 flambeau-type wall brackets and a massive central ceiling fixture. All the fittings were designed specially by the Fittings and Fixtures Department of the General Electric Co., Ltd., and "Osram" gasfilled lamps are employed. The installation work was carried out by Messrs. Foote & Milne, 15, Stockwell Road, S.W.9.

Lamp Business in Switzerland.

The Philips Lampen Gesellschaft is the name of a new company which has just been formed in Zurich (3, Rue Thalberg), to handle the business in Philips lamps, &c., in Switzerland.

German Exports to New South Wales.

The *Board of Trade Journal* states that during October last New South Wales imported German electrical appliances valued at £1,104 and vacuum cleaners valued at £4,187.

A French View of the British Market.

The French Commercial Attaché in Great Britain has made some interesting observations on the subject of our new Electricity (Supply) Act. After referring to the object of this measure, he reports that the principal British electrical manufacturers have already revised their production programme in anticipation of an increase in the demand, and that several among them during the past few months have even doubled their staff. Importers on their side, he adds, have been equally active. The Commercial Attaché notes also growing activity among the manufacturers of wire, meters, and accessories. Building contractors, he says, are now adopting the system of electrically equipping most of the new houses, as it is foreseen that there will be a general adoption of electricity for domestic purposes. With regard to the houses already constructed, it is estimated that only one-fifth of the 7 to 10 million houses which are within one or other of the distribution systems are already supplied with adequate equipment. The Commercial Attaché therefore emphasises that for electric household appliances, as well as accessory material, new openings are arising in England, and he draws the attention of French export manufacturers to this market.

Big South American Scheme.

A message from Brussels published in Berlin, states that the Compania Hispano-Americana de Electricidad, of Madrid (the successor to the German Transmarine Electricity Co.), proposes to establish in the new harbour at Buenos Ayres a generating station of 900,000 h.p., which will be "the largest works hitherto constructed," and will be equipped with 12 turbines, each of 75,000 h.p.

A Peruvian Hydro-Electric Contract.

It is stated that the Bergmann Electricity Company, of Berlin, has received an order from the Government of Peru in connection with the impending establishment of a hydro-electric works at Tamboraque, near Callao. The negotiations concerning the execution of the general scheme, which contemplates the erection of a station of 12,000 kW and the construction of a high-pressure line of a length of about 25 miles, have not yet been concluded.

German Trade in India.

A new concern is reported to have been formed in Berlin under the title of the A.E.G. India Electric Co., Ltd., with a share capital of 20,000 marks. The company is to regulate the representation of the A.E.G. and allied concerns in India.

A Bradford Exhibition.

Under the auspices of the Bradford Corporation Electricity Department, an exhibition of mercury vapour ultra-violet ray equipment was opened at the electricity showrooms in Sunbridge Road, on February 2nd, by the British Hanovia Quartz Lamp Co., Ltd., and continues until February 12th. Mr. A. K. James is in attendance to explain to inquirers the healing powers of this apparatus.

Irish Electrical Imports.

The imports of electrical goods, excluding machinery, into the Irish Free State during December last, amounted to a value of only £37,004, as compared with £47,404 in the corresponding month of 1925. The aggregate imports during the whole of the past year are returned at £450,249, as compared with £403,585 in the preceding year.

Chinese Notes.

The wireless station at Pehchiko, Nanking, was opened on November 28th last, and it is now in direct communication with most of the other Chinese stations. The cost for commercial messages is the same as that for telegrams.

The Telephone Administration of Tientsin is planning the installation of modern automatic telephones in the foreign concessions. The work of installing the equipment will commence almost immediately.

In order to facilitate the transmission of military dispatches, the provincial authorities of Shantung have decided to install a long-distance telephone system throughout the province, commencing with the ten districts in the Tsinan circuit. Preparations for the installation are now being made.

The long-distance telephone service between Mukden and Chengkiatun has now been opened to the public.

Trade Announcements.

During the recent terrific storm which raged throughout Scotland, the Scottish branch offices of the RAWLPLUG CO., LTD., at 19, Wilson Street, Glasgow, were completely demolished, and stock to the value of many hundreds of pounds was destroyed. The disaster occurred in the day-time, but, fortunately, the entire staff escaped injury. Until further arrangements are made, all the Scottish business will be transacted through the head office in London.

REDMANOL, LTD., has removed to 82, Victoria Street, S.W.1.

New Catalogues and Lists.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Booklet B.C. 4,335 (32 pp.), describing "Gecophone" radio products, including headphones, loud-speakers, crystal detectors, condensers, l.f. transformers and chokes, filament rheostats, super-heterodyne components, &c. Illustrated and priced.

MESSRS. MAVOR & COULSON, LTD., 47, Broad Street, Mile End, Glasgow.—February calendar-blotter advertising the "Samson" coal-cutting machine. Also Pamphlet No. 261/5, illustrating and describing the company's ironclad control pillars for mining and industrial service.

ELECTRIC FIRES, LTD., Norwich.—Supplementary Folder No. 5, containing illustrations, particulars and prices of the company's "Heatrae" imitation coal fires.

THE BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—A series of illustrated descriptive pamphlets dealing with outdoor h.p. switchgear; oil-immersed circuit breakers; earthing resistances; air-break series-parallel starters; and d.c. and a.c. drum controllers and resistances.

MESSRS. J. BLAKEBOROUGH & SONS, LTD., Brighouse, Yorks.—A comprehensive catalogue (No. 100, 228 pp.) of valves and auxiliaries for steam power plant. Each item is illustrated and full dimensions and descriptions are given. A code is included for the use of buyers.

MESSRS. W. E. BURNAND & CO., 66-106, Shoreham Street, Sheffield.—A pamphlet illustrating a machine converted from a generator to a rotary convertor by the firm.

MESSRS. PRIDEAUX & CO., LTD., Midland Lamp Works, Macdonald Street, Birmingham.—A priced and illustrated catalogue of electric light brackets, lanterns, pendants and standards, and electric signs.

MR. O. N. BECK, 11, Queen Victoria Street, E.C.4.—An illustrated pamphlet dealing with the "Hurricane" electric hand blower for cleaning machinery, &c.

THE HART ACCUMULATOR CO., LTD., Stratford, E.15.—February calendar-blotter advertising "Hart" batteries.

MESSRS. HANS RENOLD, LTD., Burnage Works, Didsbury, Manchester.—"The Power of the Press," an illustrated folder dealing with chain driving in the printing industry.

MESSRS. W. CROCKATT & SONS, LTD., Darnley Street, Glasgow.—Illustrated pamphlet describing the "Simplex" patent electric salinometer for indicating impurity in condensate and boiler-feed water.

HOPKINSON INDUCTION MOTORS, Willesden Lane, North Acton, London, W.3.—Monthly stock list of induction motors.

MR. E. J. BATY, 157, Dunstable Road, Luton.—Leaflet describing the "Baty" condenser, and quoting terms for giving a "wireless doctor" service.

RADIO INSTRUMENTS, LTD., 12, Hyde Street, New Oxford Street, London, W.C.1.—Folder describing the company's new rectifier for battery charging.

BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, London, W.C.2.—Miniature edition (exact replica), measuring 6¼ in. by 4¼ in., for pocket use, of the company's 120-page catalogue of electric wiring supplies and domestic appliances. Pamphlet L.385a, dealing with "Pearl Mazda" vacuum and gasfilled lamps. Priced.

MESSRS. F. & A. PARKINSON, LTD., Guiseley.—Abridged list U/6, giving tabulated details and prices for two- and three-phase induction motors from 1 to 1,000 b.h.p.

MESSRS. JOHN MOORES & CO., Ravald Street Works, Salford.—February price list of various insulating materials for electrical and mechanical purposes.

NERON LAMPS, LTD., 1-3, Brixton Road, London, S.W.9.—Folder price list of "Bilux" lamps.

THE ELECTRIC HEATING CO., George Street, Croydon.—List No. 267, describing and fully illustrating the "Elect" electrical ovens and cookers; also a 36-page pamphlet containing priced and illustrated information regarding "Elect" fires, cookers, irons, and other domestic appliances.

MESSRS. I. CALVETE, LTD., 11, Little St. Andrew Street, W.C.2.—An illustrated and priced brochure dealing with "Icall" and "Everay" electro-medical appliances.

MESSRS. WATSON & SONS (ELECTRO-MEDICAL), LTD., 43, Parker Street, Kingsway, W.C.2.—A new edition of "Artificial Sunlight," a publication illustrating and describing the company's mercury-vapour, tungsten, and carbon arc lamps. Priced.

ATEL'ERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—February stock list of dynamos and motors.

MARCONIPHONE CO., LTD., 210, Tottenham Court Road, W.1.—Coloured trade poster; also illustrated and priced folder descriptive of the new indirectly-heated cathode KL.1 valve for operation off the domestic mains.

Bankruptcy Proceedings.

ERNEST FREDERICK WOODGATE, 7, St. John's Terrace, Weymouth, Dorset, and Brunswick Cottage, Weymouth, electrical engineer.—This public examination was held recently at Dorchester. The statement of affairs showed liabilities of £155, against assets of £224. In October, 1922, debtor commenced business with a capital of £30. He had not kept a complete set of books, and no accounts had been prepared showing the profits or losses. Several creditors obtained judgments against him, and an execution was levied on his effects early in January, which was paid out. During the strike of last year and when he was being pressed, his solicitor advised him to file his petition. The examination was closed.

F. H. THOMAS, electrical engineer, carrying on business with W. E. Evans as Thomas & Evans, at Salubrious Chambers, Salubrious Passage, Swansea.—Bankrupt discharged as from January 1st, 1927.

C. G. HOFMAN (L. J. Chambers & Co.), wireless components manufacturer and electrical engineer, Andrews Works, Cowthorpe Road, Wandsworth Road, S.W., and 7a, Victoria House, South Lambeth Road, S.W.—Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.1, released January 1st, 1927.

J. N. DAVENPORT and L. A. HACKETT (Davenport, Hackett and Co.), electrical engineers and contractors, 36, Spring Gardens, Manchester.—Last day for proofs for dividend, February 15th. Trustee, Mr. A. Grierson, 21, Spring Gardens, Manchester.

J. H. DOLLITTLE (Zenith Radio Manufacturing Co.), wireless engineer, Virginia House, Portsmouth Road, and 17, Park Street, Guildford.—First and final dividend of 2s. 3½d. in the £, payable February 16th by the Official Receiver, 29, Russell Square, W.C.1.

W. R. SQUIRE, electrical engineer, 11, Steward Street, Spring Hill, Birmingham.—Trustee, Mr. C. Hoult, Official Receiver, 191, Corporation Street, Birmingham, released January 26th.

G. R. SIMS, motor and electrical engineer, Hartlepool Street, Thornley, Durham.—Receiving order made February 1st on debtor's own petition.

Private Arrangements.

SOUTHERN SALES CO., Rye, Sussex, electrical and radio dealers.—A meeting of creditors was held on January 31st at Winchester House, E.C., when the chair was occupied by Mr. E. H. Hawkins, representing the largest creditors. A statement of affairs was presented which disclosed a surplus of assets over liabilities of £343. The liabilities totalled £4,681, and there were also unsecured loan creditors for £2,448. The net assets were £7,472. The solicitor for the debtors said that he had called the meeting in conjunction with Mr. Fox, the accountant who had prepared the statement of affairs. The business was started by Mr. G. W. Page and his son in 1923. Shortly afterwards a Mr. Garrard became a partner, and in 1924 the business was transferred to Rye. The turnover then increased very rapidly, and in his (the solicitor's) opinion the present position had been brought about by over trading. Various loans totalling £2,448 had been obtained from time to time from friends of the partners. With the exception of £500 of that money, the loan creditors were prepared to stand aside provided some scheme was adopted. It was thought that if the business could be carried on, there was every prospect of the creditors being paid in full. Another suggestion was that the business should be converted into a limited company, the creditors taking first debentures and the loan creditors second debentures. Mr. Page, junr., had retired from the business. For the two years ended February 28th, 1925, the accounts showed that there was a trading profit of £624 on a turnover of £12,219. In the following year there was a further profit of £730, the turnover being £13,651. It was decided that a committee of five should be appointed to investigate the position and report to the creditors as to the best method of securing the continuance of the business, subject to no proceedings being taken against the assets of the business, and to further purchases being for cash only. The committee appointed consisted of Mr. C. Latham, Mr. E. H. Hawkins, and representatives of the North British Rubber Co., the Vacuum Oil Co., and Moseley & Sons.

Company Liquidations.

WATSON, JONES, LTD., wireless and electrical factors, 235a, Blackfriars Road, London, S.E.—A meeting of the creditors was held on February 2nd at Caxton Hall, Westminster. Mr. George Dickinson, certified accountant, of Messrs. Leonard Dickinson & Co., 82, Victoria Street, S.W., who presided, stated that he had been appointed to act as the liquidator in the voluntary liquidation. The statement of affairs presented disclosed unsecured liabilities of £8,330 and the assets totalled £4,725, from which had to be deducted £194 for preferential claims, leaving net assets of £4,530, or a deficiency of £3,800. The asssets included cash at bank and in hand, 11s. 3d.; stock-in-trade, £2,232, estimated to realise £1,500; shares in the B.B.C., £10 11s. 3d.; and sundry debtors, £3,174, estimated to produce £2,750. The issued share capital of the company was £4,579, so that there was a deficiency, as regarded contributories, of £8,379. The liquidator said that stock had been taken at cost or market value, and he was informed by Mr. Watson, the managing director, that it had been taken on the lowest possible basis. The book debts were practically all good. Mr. Dickinson said that the company was formed in December, 1925, with a nominal capital of £10,000, of which £4,579 had been issued. £1,579 had been subscribed in cash, and £3,000 worth of shares were allotted to the three partners of the old business which was taken over. Since the inception of the company the turnover had been about £45,000, but the expenses had been so heavy that they had more than wiped out the profit.

In reply to Mr. P. Houston, of Messrs. Corfield & Cripwell, the liquidator said that there were certain suing creditors, and that was one of the reasons why the company had decided to wind up. The company had never made a profit. The four directors were Messrs. Watson, Jones, Eckford, and Bowditch.

Mr. Houston said that the creditors ought to have some figures as to the trading, because it seemed curious that a concern which was formed as late as the middle of December, 1925, and at that time had a surplus of assets over liabilities of £3,000, should within 12 months be in the present position.

The liquidator said that the turnover was £44,726 for the 13 months of the company's trading, and there was a gross profit of £4,456. The gross profit was absorbed by the following expenses:—Wages, £3,300 (that figure included directors' salaries); motor-van expenses, £1,090; travellers' commission, £525; rent, rates and taxes, £636; bad debts, £617; and other small items, bringing up the gross total to £7,721. Three of the directors had drawn £6 per week, and one £7 weekly.

Mr. Watson, a director, said that before the company was formed, they got out a balance-sheet, and it was evident that it would be difficult to carry on without additional capital. Mr. Eckford then came along and offered to put up capital and found certain friends also willing to put up money. The company was formed because Mr. Eckford insisted on it being done. The partnership had been going about 3½ years. The stock was principally wireless apparatus.

After some further discussion, Mr. Hunter, of the Wireless and Radio Trades Guardian Association, said that the case was one where a creditors' nominee ought to liquidate the

company. He proposed that another liquidator should be appointed in the place of Mr. Dickinson. The resolution was duly seconded and, on a show of hands, was carried. A poll was demanded, however, and the liquidator declared that the resolution was lost. An amendment for the appointment of a joint liquidator was also lost. A resolution was then passed confirming the voluntary liquidation, with Mr. Dickinson as liquidator.

The following are creditors:—

	£		£
Auto Sundries, Ltd. ...	100	Hunt, A. H., Ltd. ...	346
Burndept Wireless, Ltd.	99	Hart Bros.	31
Beard & Fitch	25	Igranic Electric Co., Ltd.	232
Bolwell, W.	34	London Electric Wire Co.	67
Bulls Rubber Co. ...	31	Siemens Bros. & Co., Ltd.	28
Bowyer, Lowe Co., Ltd.	72	Shaen, Roscoe, Massey and Co.	38
Brown Bros., Ltd. ...	46	Siemens & English Electric Co., Ltd.	1,200
British Thomson-Houston Co., Ltd.	249	Telegraph Condenser Co.	97
Benjamin Electric, Ltd.	59	Trojan, Ltd.	44
Brownie Wireless Co. ...	36	Vandervell, C. A., & Co.	59
Cole, E. K.	29	Leyland Motors, Ltd. ...	69
Clayton Rubber Co. ...	30	Metro - Vick Supplies, Ltd.	464
Climax Radio Electric, Ltd.	32	Marconiphone Co., Ltd.	732
Cleartron Radio, Ltd. ...	25	Mullard Radio Valve Co., Ltd.	274
Cahill & Co.	67	McMichael, L., Ltd. ...	38
Cossor, A. C., Ltd. ...	191	New London Electron Works	57
Dubilier Condenser Co., Ltd.	124	Odhams Press, Ltd. ...	38
Dwyer, P. L., & Co. ...	80	Oliver Pell Control, Ltd.	26
Edison Swan Electric Co., Ltd.	104	Peto, Scott & Co. ...	53
Ever-Ready Co. (G.B.), Ltd.	167	Phillips Lamps, Ltd. ...	35
Ede, C., & Co., Ltd. ...	45	Proctor, E., & Sons, Ltd.	53
Formo Co., Ltd. ...	29	Radio Communication Co., Ltd.	100
Ferranti, Ltd.	107	Ruhl, O.	87
Graham, A., & Co. ...	142	Radio Instruments, Ltd.	141
General Electric Co., Ltd.	94	Reed, R. N.	102
Garnett, Whiteley & Co., Ltd.	40	Yesley Electric Supplies	41
Hart Accumulator Co., Ltd.	41		
Hough, J. E., Ltd. ...	200		

NATIONAL WIRELESS CORPORATION, LTD., 112, Westminster Bridge Road, S.E.—The first meeting of the creditors and shareholders of this company was held last week at Carey Street, W.C. Mr. E. T. A. Phillips, Official Receiver, reported that the winding-up order was made last December on the petition of a creditor for £60 in respect of £50 lent to the company and law costs. The company was formed in February, 1925, with a nominal capital of £1,000 to carry on business as radio and general engineers. Subsequently it was decided to increase the capital to £20,000, and at the date of the winding-up order the issued capital was £3,363. The intention was to open retail shops and a wholesale depôt to deal in wireless apparatus. In August, 1925, the capital was increased to £3,500, and a shop was opened at Raynes Park and a warehouse in Little Pulteney Street. The property at Raynes Park had been disposed of to a company, part of the consideration being a debenture for £250 charged on the property. In 1926 an arrangement was made by the directors with a Mr. G. E. Hill and the British Fiduciary Co., Ltd., for the latter to secure subscriptions for the shares on a commission basis. In the transactions which followed, shareholders of the Burndept Wireless Co. were invited to hand over their shares in exchange for the shares of this corporation, and as a result 3,552 Burndept shares had been obtained. Some of the number had taken action against the corporation to obtain an injunction restraining it from acting on their application for shares and from parting with the proceeds of sale of their shares in the Burndept Company, the allegation being that the shares were obtained from them by misrepresentation; it was understood that some of those actions had been settled by Mr. Hill. Various sums had been paid to Mr. Hill as commission. The liabilities of the corporation amounted only to £396, and as the assets were valued at £392, the creditors would doubtless receive a substantial dividend, but the shareholders, whose loss was estimated at between £2,000 and £3,000, could not hope for any return for their money. In the absence of any resolution, the liquidation was left in the hands of the Official Receiver.

ELECTRIC LIGHT AND POWER CONTRACTS FINANCE CORPORATION, LTD.—A petition for the winding up of this company has been presented to the High Court by Messrs. H. Saunders, Ltd., of 40-41, Great Charles Street, Birmingham, and will be heard in London on February 15th.

BRITISH ELECTROLYTIC ZINC CO. (ISHERWOOD PROCESS), LTD.—Winding up voluntarily. Liquidator, Mr. E. Fairweather, Pinners' Hall, Austin Friars, E.C. Meeting of creditors, February 16th, at Pinners' Hall. Particulars of claims to the liquidator by February 21st.

UNIVERSAL RADIO SYNDICATE, LTD.—A meeting of members is called for March 9th at Marconi House, Strand, W.C., to hear an account of the winding up from the liquidator, Mr. F. A. Walrond.

RADIO PHONOPORE AND ELECTRICALS, LTD.—First and final dividend of 2s. 8d. in the £ payable February 28th at 3, Frederick's Place, Old Jewry, E.C.

BRITISH BROADCASTING CO., LTD.—Winding up voluntarily. Liquidator, Sir J. C. W. Reith. A meeting of creditors was held at the Hotel Cecil on February 7th, when the voluntary liquidation was confirmed. (This notice is purely formal, all creditors have been or will be paid in full.)

NEUTRON, LTD.—A petition for the winding up of this company has been presented to the High Court by Messrs. M. & J. Macrae (Macrae Bros.), wireless manufacturers, St. James' Avenue, West Ealing, creditors, and will be heard in London on February 15th.

RADIO CABINETS, LTD.—Winding up voluntarily. Liquidator, Mr. O. A. Hibbert, Capel House, 54, New Broad Street, E.C.2. Meeting of creditors at Capel House on February 15th. Particulars of claims to the liquidator by March 15th.

UNIQUE WIRELESS CO., LTD.—A meeting of creditors was held on February 4th at 132b, Regent Street, W. Liquidator, Mr. A. S. Hobbiss, 9, Beachcroft Mansions, Streatham, S.W.16.

Dissolution of Partnership.

W. D. FLETCHER and H. CALDWELL, electrical supplies merchants, 86, Bath Street, Glasgow.—Messrs. Fletcher & Caldwell have dissolved partnership on the retirement of Mr. Fletcher. Mr. Caldwell will continue the business on his own account and in his own name.

Indian Cable Sports.

We have received interesting particulars of the first annual sports of the Indian Cable Co., Ltd., which took place at Tatanagar, B.N. Railway, on Saturday, January 15th. The factory of the Indian Cable Co. is under the control of British Insulated Cables, Ltd. It is now in its fourth year, and combines wire-drawing and cable-making. It is the only works of its class in India. At the sports referred to the events, which were keenly contested, comprised the usual flat races, high and long jump, putting the weight, and the more spectacular items, such as sack fight, obstacle race, and wrestling. The arrangements were carried through by the Employés' Welfare Committee, which includes amongst its activities, football, cricket, badminton, volley ball, a dramatic club, and a lending library. When one considers the nationalities, tongues, tribes and castes covered by the word "Indian," one commences to realise the difficulties to be overcome in arranging competitions. Hindi, may be likened to Esperanto, a universal language of the North, but it fades away in Central India, and on the sports ground could be heard Punjabi, Nepali, Urdu, Bengali, Hindustani, Santali, Ho, Tamil, Telugu, Malayalam, Kanarese, and Gujarati. North, South, East and West had met to try their skill, individually, and they intermingled in team events. Caste and creed were forgotten and the spirit of sport reigned supreme. Coolies and Rejas who had never before seen an organised sports meeting, competed in the events for novices, the prizes of clothing being supplied by Mr. R. B. Paul (Calcutta), the managing director. The championship cup, given by Mr. F. W. Leake, director, was won by M. Joseph (Madras), of the cotton covering department, with 9 points, P. C. Chatterji (Bengal), of the wire mill, finishing a good second, with 7 points. Brawn met brains in the final of the tug-of-war, the general office being unable to hold the more robust wire mill team. In all it was a most successful meeting, and marks a step in linking up the Empire, not only with cables, but with the bonds of good fellowship.

New Domestic Appliance Venture.

At last week's meeting of John Shaw & Sons, Ltd., Wolverhampton, Mr. G. Terrell (chairman) said that the company had launched out into a new field of activity at Wolverhampton by the opening of an electrical department. They had found that the thousands of ironmongers with whom they did business throughout the country were to some extent extending their operations to the sale of domestic electrical appliances. The department had barely had a month's trial. It would be developed on the lines of the old business. It would not involve them in any new establishment expenses, and would keep them in the forefront as a distributing house. It would, of course, take some little time to build up, but he was hopeful that it would result in substantial profits.

Callender's Hospital Fund.

We have received a copy of the 24th annual report of Callender's Hospital and Distress Fund. This shows that a total of over £880 was distributed between a number of hospitals and kindred institutions; Guy's Hospital received £250, the Erith and District Hospital £105, and the Metropolitan Convalescent Institution £110. In addition to this, 609 hospital letters were issued; 239 surgical appliances were provided at a cost of £102; 120 pairs of spectacles were provided, costing £34; and in a number of other directions the Committee, of which Mr. H. Pragg is chairman and Mr. J. W. Giles hon. secretary and treasurer, did excellent work.

The Shipping, Engineering, and Machinery Exhibition.

This biennial exhibition is to be held at Olympia from September 8th to 24th next. The organisers, Messrs. F. W. Bridges & Sons, Ltd., Avenue Chambers, Southampton Row, W.C.1, inform us that 90 per cent. of the available space has already been booked, mainly by previous exhibitors. Arrangements are being made to invite overseas buyers, and a number of engineering institutions are being requested to pay official visits to the exhibition.

Company Law Amendment.

Parliament reassembled on Tuesday last. One of the first matters which will receive consideration this session is the amendment of the existing company law. *The Times* says that a Bill for this purpose will be introduced into the House of Lords, based upon the recommendations of the Departmental Committee which reported last year. The necessity for two meetings for the passing of a special resolution will be dispensed with, and the Bill will prevent directors from contracting out of all liability for loss except when it is due to their "wilful neglect or default." An undischarged bankrupt will not be permitted to be a director or to take part in the management of any company without the leave of the Bankruptcy Court. The investigation and prosecution of offences will be facilitated, and it is hoped to make it less common for offenders to escape prosecution when a company is wound up voluntarily. Additional facilities will be given to shareholders for obtaining copies of the balance-sheet, and the accounts of holding companies must state how the aggregate profits and losses of their subsidiary companies have been dealt with in the accounts. House-to-house hawking of shares will be prohibited, and steps will be taken to hamper the dishonest touter of shares by making it compulsory to disclose a certain minimum of information which he may find it inconvenient to give.

Book Notices.

"Official South African Municipal Year Book, 1926-27." Edited by W. P. M. Henderson and F. G. Pay. (Pp. 505 and tables.) London: E. G. Allen & Son, Ltd., 12 and 14, Grape Street, W.C.2. Price 25s. net.—This latest edition of the standard municipal compendium for South Africa and Rhodesia has again been brought up to date. All phases of municipal activity are dealt with, the business of electricity supply receiving ample treatment. It is noted that 19 new undertakings were laid down during the past year. Even greater developments may be expected when the Electricity Supply Commission is in a position to supply electricity in bulk from its super-power stations. One of the tables gives full particulars of the plant installed, &c., in municipal power stations.

"The Electrical Trades Directory and Handbook, 1927" ("The Blue Book"). (1,432 pp.) London: Ernest Benn, Ltd. Price 25s. net.—This is the 45th consecutive issue of this directory. The principal features are retained, having been brought up to date. In particular, the section dealing with the law relating to electricity supply has been revised in the light of the new Electricity (Supply) Act. An innovation is the provision of a celluloid thumb index to the various sections of the work.

"A Handbook of Physics Measurements." By E. S. Ferry. Vol. I. Fundamental Measurements, Properties of Matter and Optics. Second edition, revised. Pp. xii+288; figs. 162. Price 12s. 6d. net. "Laboratory Manual for Automotive Electricity." By W. R. Varner and F. C. Smith. Pp. ix+199; figs. 157. Price 10s. net. "Electro-Organic Chemistry." By C. J. Brockman. Pp. xi+381; figs. 15. Price 25s. net. London: Chapman & Hall, Ltd.

"Science Abstracts" (A and B). Vol. XXX. Part I. No. 349 and Indexes to Vol. XXIX. London: E. & F. N. Spon, Ltd. Price 3s. each.

"Machine Tool Driving and Feed Gear Boxes." By H. C. Town, F.R.S.A. "Some Considerations in the Design of Spur and Helical Gearing." By H. Walker, B.Sc. The Association of Engineering and Shipbuilding Draughtsmen. Price 2s. each.

"Technologic Papers of the U.S.A. Bureau of Standards," No. 330, "Resistance of Conductors of Various Types and Sizes as Windings of Single-Layer Coils at 150 to 6,000 kilocycles" (5 cents).

"Gramophone Tips." 1927 edition, has been received from Mr. H. T. Barnett, M.I.E.E., 123, High Street, Old Portsmouth (price 1s. post free). It contains, in addition to the author's excellent "tips," very eulogistic references to the electrical system of recording which has been adopted.

"The Practical Electrician's Pocket Book, 1927." Edited by H. T. Crewe, M.I.Mech.E. Pp. 602+xci; fully illustrated. London: S. Rentell & Co., Ltd. Price 2s. 6d.—In this 29th edition of the above pocket book many of the chapters and sections have been revised, and new ones have been added. The revision work includes the sections on illumination and lamps, and also that on gas, oil, and petrol engines. The new sections deal with fault localisation, a.c. motors, installation testing, and other subjects of interest to the electrical engineer. The section on central stations has again been enlarged.

Scientific Papers of the U.S.A. Bureau of Standards, No. 537: "Formula for the Inductance of a Helix Wire made with Wire of any Section" (25 cents). No. 538: "Spectral Energy Distribution of the Light Emitted by Plants and Animals" (10 cents).

"History of Radio-Telegraphy and Telephony," by G. G. Blake. Pp. xix+425; illustrated. London: Radio Press, Ltd. Price 25s.

"The New Electricity Act," by W. S. Kennedy. Pp. 142. London: Ernest Benn, Ltd. Price 6s. net.

E.D.A. Conference Alteration.

We are informed that as Mr. Morshead finds himself unable to fulfil his engagement to read a paper on "Refrigeration" at the E.D.A. Conference on March 18th, his place will be taken by Mr. N. E. Barber, who will deal with the same subject.

Fulham Civic Week.

The first Civic Week ever to be held by a London borough commenced at Fulham last Saturday. One of the principal features of the week is an exhibition, at the Fulham Baths, of the various industries connected with the Borough, and it is pleasing to note that electricity is well to the fore. The Borough Council Electricity Department has an exhibit occupying six stands showing the domestic application of electricity; various types of domestic apparatus are displayed, and the exhibit is arousing considerable attention. Another interesting exhibit is that of Mr. E. R. Armfield, builder and electrician.

For Sale.

Reigate Corporation invites offers for surplus generating plant installed at the Electricity Works, Wray Common Road. By order of the joint receivers and liquidators of Eastwood, Swingler & Co., engineers, &c., of Osmaston Road, Derby, Messrs. Richardson & Linnell will sell by auction at St. James' Sale Rooms, Derby, on March 8th, the freehold property, plant, buildings, and machinery, &c. (See our advertisement pages to-day.)

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, &c.	Price Feb. 8th.	Fortnight's inc. or dec.
a Acid, Oxalic ... ... per lb.	5¾d.	...
a Ammoniac, Sal ... ... per ton.	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ... ... ,,		...
a Borax ... ... ,,	£25	...
a Copper Sulphate ... ... ,,	£25 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a ,, Perchlorate ... ... ,,	5½d.	...
a Shellac ... ... per cwt.	£13 10s.	...
a Sulphur, Commercial ... ... ,,	£9 10s.	...
a ,, Roll ... ... ,,	£9 10s.	...
a Soda, Chlorate ... ... per lb.	3½d. to 3¾d.	...
a ,, Crystals ... ... per ton.	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots... ... ... per ton.	£107 to £113	...
b ,, Wire ... ... per lb.	1/6 to 2/-	...
b ,, Sheet ... ... ,,	1/8 to 2/9	...
p Babbitt's Metal and Anti-friction Metal—		
Grade I ... ... per ton net.	£267	£12 inc.
Grade II ... ... ,, ,,	£185	£5 inc.
Grade III... ... ... ,, ,,	£96	...
c Brass (rolled metal 2" to 12" basis) per lb.	9¾d.	...
c ,, Tubes (solid drawn) ... ,,	11¾d. to 1/-	...
c ,, Wire, basis ... ... ,,	9¾d.	...
c Copper Tubes (solid drawn) ... ,,	1/0½	...
c ,, Bars (best selected) ... per ton.	£83	£2 dec.
c ,, Sheet ... ... ,,	£88	£2 dec.
c ,, Rod ... ... ,,	£84	£2 dec.
d ,, (Electrolytic) Bars ... ,,	£60 10s.	5s. dec.
d ,, ,, Sheets ... ,,	£144 10s.	...
d ,, ,, Wire Rods ... ,,	£74 15s.	...
d ,, ,, H.C. Wire per lb.	9d.	¼d. inc.
f Ebonite Rod ... ... ,,	2/3 to 2/6	...
f ,, Sheet ... ... ,,	2/3 to 2/6	...
a German Silver Wire ... ... ,,	2/2	...
h Gutta-percha, fine ... ... ,,	8/-	...
h India-rubber, Para fine ... ... ,,	1/4	¼d. dec.
i Iron Pig (Cleveland No. 3.) ... per ton.	122/6	...
i ,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g Lead, English pig ... ... ,,	£28	...
g Mercury ... ... per bot.	£17 10s.	...
e Mica (in original cases) small ... per lb.	3d. to 3/-	...
e ,, ,, medium ... ,,	4/- to 8/-	...
e ,, ,, large ... ,,	10/ to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/3½	...
p ,, ,, drawn bars & rods ,,	1/3	...
p ,, ,, rolled strip & sheet ,,	1/2½	...
p ,, ,, wire... ... ... ,,	1/3½	...
o Platinum ... ... per oz.	£23	...
d Silicium Bronze Wire ... ... per lb.	10¼d.	...
r Steel, Magnet, in bars ... ... ,,	7½d.	...
n Tin, Block (English) ... ... per ton.	£303 10s to £304	£2 10s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/9	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd
g James & Shakespeare.
h Edward Hill & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Messrs. James Forster & Co., reporting on February 5th, state that so long as the lead market here is glutted with extra supplies from the Continent there can be no hope of any alteration in present conditions. On the other hand, an improved demand from consumers both here and on the Continent, especially if coinciding with a decrease in arrivals, would result in a sharp recovery from the present low level of values.

Czech-German Co-operation.

A scheme is being promoted for the transfer of the Bodenbach Machine Works, belonging to the Bohemian-Moravian Electrotechnical Works (Krizik) to a new company, in which the shares will be held in equal halves by the present owning company and the Berlin A.E.G., and in this way the new concern will have the advantage of the patents of the American General Electric Company. The other works of the Krizik Company—the cable and insulator works in Bodenbach, the Chaudoir Metal Works, and the Karolinenthal Works—are to be combined into a single company. The Karolinenthal Works will be extended so as to produce high- and low-pressure apparatus and complete switchboard installations.

British Manufacturers' Representatives in Leningrad.

A correspondent states that the arrival in Leningrad is reported of Messrs. Richard and Simons, of the Metropolitan-Vickers Company. In the course of a conversation with a representative of a Moscow newspaper, they are stated to have said that the company was at present executing orders for electrical plant for Russia of the value of 10,000,000 roubles. Two turbo-generators of 20,000 kW were in hand for Baku, while the installation had been completed in Leningrad of a turbine of 30,000 kW for the Krasni Oktyabr station. The company had received orders for the construction of a turbine of 45,000 kW, and for two turbines for the Moscow combination (Moges) of 17,600 kW. It was added that the object of the visit was to enter into negotiations respecting the company's further participation in the electrification of Russia.

Patents in Esthonia.

The *Board of Trade Journal* states that the Esthonian Legislature has passed a law providing for the registration of patents and trade marks belonging to British subjects which were registered in Russia prior to February 24th, 1918. Applications must be sent in by May 23rd next.

Lamps by the Million.

The GENERAL ELECTRIC CO., LTD., claims to have made over 200 million "Osram" lamps of all kinds, from the giant lighthouse lamp, which is 2 ft. long, to the smallest pocket torch lamp. The company continues to receive very large orders, among the latest being one from the Admiralty for 215,000, and another from the General Post Office for 150,000.

Lighting and Power Notes.

Aldershot.—ELECTRICITY SCHEME.—As the result of a conference of representatives of the Town Council, the Farnborough, Farnham, Fleet and Frimley Urban District Councils, and the Hartley, Wintney and Farnham Rural District Councils, it has been decided to approach the Electricity Commissioners with regard to a scheme for supplying electricity in the area concerned which does not appear to have been dealt with by the Commissioners in connection with the supply of electricity in bulk from any station erected or to be erected in the future. Supply companies in the area and the Alton Urban and Rural District Councils are being invited to associate themselves with the Conference.

Audenshaw. — STREET LIGHTING. — The Urban District Council has asked a sub-committee to report upon the question of lighting all the main roads by electricity. Meanwhile it is proposed to arrange for all night electric lighting in Delta Road, electricity being supplied by the Manchester Corporation at 1d. per kWh, with a view to obtaining data in connection with the general question of adopting electricity for street lighting.

Australia.—TASMANIA.—We have received from Mr. H. A. Curtis, chief engineer and general manager of the Tasmanian Government Hydro-Electric Department, a copy of his report for the year ended June 30th last, together with branch reports. The income from the operation branch amounted to £172,612, the major part of which was derived from the sale of electricity in bulk. The working expenses amounted to £19,898, and there was a gross profit of £152,714. The Hobart branch earned a revenue of £110,551, against which was charged working expenses of £13,592, and the purchase of bulk supplies amounting to £46,325, leaving a gross profit of £50,635. The Derwent Valley service recorded a revenue of £5,110, and working expenditure of £3,243, leaving a gross profit of £1,867, which was transferred to a main joint account, together with the gross profits from the operation and Hobart branches, and interest, making a total of £205,373 available. Interest and other charges absorbed £211,326, and the net debit balance for the year amounted to £5,953. The result of the preceding year's working was a net loss of £20,170. The output of the Waddamana power station fell from 284,125,900 to 276,314,500 kWh, the decrease being due to the stoppage of the Carbide and Electro-Products works during alterations to the plant. Good progress has been made with the Shannon scheme. The construction of the channel for the diversion of the Shannon River was completed and work on the dam commenced. In the Hobart district new feeder lines have been constructed, existing lines have been changed over from 6,600 to 11,000 V, and a new 500-kVA sub-station, capable of being duplicated, has been constructed.

LAUNCESTON (TASMANIA).—The report on the working of the city electricity undertaking (engineer: Mr. R. J. Strike) for the year ended June 30th last shows a total income of £61,475, as compared with £63,930 in the preceding year. Working expenses amounted to £42,930, as against £45,196, leaving a gross profit of £18,545 (£18,734). After deducting interest and sinking fund charges there was a net surplus of £2,001, as compared with £3,285, which was transferred to reserve. The sales of electrical energy increased from 5,964,709 to 6,372,370 kWh.

Ayrshire.—ELECTRICITY SUPPLY.—At a recent meeting of the Ayrshire Electricity Board it was reported that terms had been arranged for a supply of electricity to Turnberry Hotel and Ayr Harbour for the L.M. & S. Railway Co. It was felt that the present boilers were inadequate, and to remedy this an expenditure of £47,500 would be involved. The Board has the matter in hand.

Bath.—ELECTRICAL DEVELOPMENT.—The *Financial News* reports that on February 3rd, Madame Sarah Grand, Mayoress of Bath, inaugurated the reconstructed Corporation electricity works, starting a 7,000-kW turbo-alternator. Alderman Sir Harry Hatt, chairman of the Electricity Committee, stated that since 1901 the demand for electricity had increased from 500 to 5,000 kW, the works capacity from 600 to 13,500 kW, the invested capital from £81,000 to about £500,000, and revenue from £11,000 to over £65,000 a year.

Beckenham.—ELECTRICITY SUPPLY.—The London and Home Counties Joint Electricity Authority will not sanction the proposal of the Urban District Council to install a further 3,000-kW turbo-generator, and the Electricity Committee has recommended putting forward a case for plant extensions rather than taking a bulk supply as suggested by the Authority.

Bexhill.—CABLE EXTENSIONS.—The Electricity Committee has prepared a scheme for additional feeder and distributor cables, &c., at a cost of £5,300.

Burnley.—ELECTRICAL PROGRESS.—During December the Corporation Electricity Department connected 53 new consumers, and there were 97 applicants waiting for service. There were 36 houses wired, and 100 cookers were connected up. The value of the appliances sold and installed on hire-purchase during 1926 was £5,519.

Canada.—SASKATCHEWAN.—The Saskatchewan Government has appointed a Commission to inquire into the economic practicability of generating electricity at central power plants and water power sites for distribution throughout the province. The Commission was created by Order-in-Council under the Public Enquiries Act. A similar but abortive inquiry was made in 1912.—*Reuter's Trade Service* (Regina).

Cheltenham.—LOAN.—The Corporation Electricity Committee is to apply for sanction to a loan of £10,000 for mains and services.

Colchester.—NEW POWER STATION.—At a meeting of the Town Council on February 2nd it was reported that good progress was being made with the construction of the new power station, and it was hoped that it would be in operation by July or August next.

Continental.—SWITZERLAND.—The municipal authorities of Zurich have applied to the Aargau Cantonal authorities for a concession to utilise the water power of the Limmat river near Weltingen. The scheme provides for the construction of a dam sufficient for minimum and maximum outputs of 14,000 and 25,000 kW, respectively. The local authorities of Scanfs, in the Engadine, have also applied for a concession to establish a hydro-electric plant near Taralp at a point where it is estimated a minimum of 300,000 h.p. is available. A scheme is also reported to be under consideration for the establishment of a hydro-electric power station on the Lower Aare river, near Klingnau, the electricity from which would be "exported" to Wurtemberg.

Crediton.—ELECTRICITY SCHEME.—Following a visit paid by a deputation to the Electricity Commissioners with a view to expediting the proposed electricity scheme, it was reported at a recent meeting of the Urban District Council that consent had been obtained for it to proceed with the work of linking up with Exeter for the purpose of an electricity supply. The Council has instructed the engineer to invite tenders for the work.

Hamilton.—NEW SUB-STATION.—Permission was recently granted at the Dean of Guild Court for the erection of a sub-station for the Town Council.

Hawarden.—ELECTRICITY EXTENSIONS.—The engineer to the Rural District Council (Mr. A. J. Richardson) writes to emphasise, in connection with the note in our issue of January

28th under the above heading, that his Council has merely postponed, not abandoned, the idea of supplying electricity to Cymmau, Ffrith, and Tryddyn.

Hemsworth.—WIRING OF SMALL HOUSES.—The Rural District Council has accepted the tender of the Electrical Distribution of Yorkshire, Ltd., for wiring houses at South Kirkby and supplying electricity on the current limiter system at 1s. 5d. per week during the winter months, and 1s. 2d. per week during the summer months.

Hull.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to a loan of £187,000 for mains and services.

Liverpool.—ACQUISITION OF UNDERTAKING.—At the last meeting of the Electricity Committee the Town Clerk reported the completion of the agreement for the acquisition of the undertaking of the Hightown Electricity Co. The town clerk, city treasurer, and city electrical engineer were authorised to take the necessary steps for carrying on the undertaking pending the actual transfer thereof to the Corporation. The Electrical Engineer has been authorised to execute such works as may be necessary to enable the Corporation to supply the company's district pending the transfer, at a cost of not exceeding £2,000.

SUB-STATION EQUIPMENT.—Authority has been given for the installation of equipment at the following sub-stations: Hampton Street, Stoneycroft, Walton Hall Avenue, and Norris Green housing estate. An underground sub-station is to be constructed at Princes Park Gates, and h.p. and l.p. mains laid to supply the surrounding district.

London.—SOUTHWARK.—An inquiry was opened at the Town Hall on February 2nd, and continued on the 3rd and 4th, by Col. T. C. Ekin into the application of the Borough Council for sanction to extend its power station. The application was opposed by the London Power Co. and the County of London Electric Supply Co., Ltd., as ratepayers. For the Borough Council it was stated that the electricity undertaking had always been a profitable one since its inception, with the exception of one year. There were three electricity undertakings in the borough, and one had offered a bulk supply at an annual charge of £15,000. The cost of the proposed extension would be approximately £37,500, whereas the capital expenditure which would be incurred by the Council if a bulk supply was substituted would be £40,000. The present capacity of the plant was 4,800 kW, and the maximum demand during 1926 was 3,200 kW. The inquiry is to be resumed to-day (Friday).

Maldens and Coombe.—ELECTRICITY SUPPLY.—The Urban District Council has entered into an agreement with the Wimbledon Borough Council for lighting the whole of the district by electricity.

Manchester.—PROGRESS DURING DECEMBER.—During the month of December the Corporation electricity undertaking showed an increase in connections of 3,160 kW, bringing the total to 300,049 kW; and the number of applications received for supply, including consumers for additional supplies, was 1,010, representing a total of 2,413 kW. The number of hired cookers connected increased by 192, bringing the total actually on circuit to 2,691. Applications for the hire of cookers totalled 93. The maximum supply demanded reached 140,960 kW; this constitutes a record for the undertaking. Two new sub-stations were put into commission during the month.

Montgomery.—ELECTRICITY SUPPLY.—The Town Council recently further considered the question of an electricity supply for the district. The North Wales Power Co. had intimated that some delay would occur before a supply for the district could be given from its system. A letter was also received from Mr. L. S. Davey, Corlan, Montgomery, who stated that he was in a position to put a scheme before the Council and, if that was accepted, there should be no difficulty in providing a supply before the summer. He asked whether the Council would consider the following:—The scrapping of the present gas plant, and giving the free use of the site for the power plant; guaranteeing a definite sum per annum for street lighting; authorising the adoption of overhead wiring. The Council decided to rescind the previous resolutions expressing agreement with the North Wales Power Company's scheme, and to apply to the Electricity Commissioners to be removed from the scheme. Pending a reply, consideration of Mr. Davey's letter was deferred.

Persia.—HYDRO-ELECTRIC SCHEME.—It is reported that the Persian Ministry of Public Works is preparing a Bill relating to a concession for the construction of a dam in connection with the utilisation for electrical purposes of the Abschar Falls, near Parkale (Schimvan).

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

LEAMINGTON.—*The Leamington and Warwick Electrical Co., Ltd.*—Lighting: From 7½d. to 7d. per kWh.

LUDDENDEN FOOT.—*The Electrical Distribution of Yorkshire, Ltd.*—A reduction of ½d. per kWh.

NORTHAMPTON.—*The Northampton Electric Light and Power Co., Ltd.*—The 10 per cent. surcharge made owing to the coal dispute has been removed.

HAWORTH.—Lighting: From 7d. to 6d. per kWh. Power: From 4d. to 3d. per kWh.

HASLINGDEN.—A reduction of ½d. per kWh to domestic consumers.

Retford.—PROGRESS OF ELECTRICITY SCHEME.—The Town Council's consulting engineers, Messrs. A. Hugh Seabrook and Partners, report that the electricity undertaking should be ready to commence supply by about the end of this month.

Rochdale.—STREET LIGHTING.—The Fire Brigade and Lighting Committee has approved in principle a scheme for lighting the main streets of the town by electricity.

Scarborough.—ELECTRICITY EXTENSIONS.—The Corporation electricity works are to be extended at an estimated cost of £47,500. It is proposed to erect a new generating station at Irton within the next five years.

Sheffield-Rotherham.—INTERLINKING SCHEME.—A scheme has been prepared for interlinking the Corporations' power stations at an estimated cost of £41,500. The scheme is subject to the approval of the Electricity Commissioners.

Stoke-on-Trent.—SUPPLY TO PUMPING STATION.—The Corporation Electricity Committee has had further correspondence with the L.M.S. Railway Co. regarding a supply of electricity to the pumping station at Whitmore. The electrical engineer reports that the cost of an e.h.p. line would be £16,640, and he has been instructed to interview the electrical engineer of the company on the matter.

EXTENSION OF SUPPLY.—The electrical engineer is to prepare a report on proposals to provide an electricity supply to Milton and Norton-in-the-Moors.

LOAN SANCTIONED.—Sanction has been received to a loan of £20,000 for mains in connection with the supply of electricity to the new works of the Michelin Tyre Co.

Tain.—ELECTRICITY SUPPLY.—The Town Council has instructed its consulting engineers, Messrs. A. Hugh Seabrook, to take the necessary steps in conjunction with the Parliamentary Agents to obtain a Special Order authorising the Council to supply electricity within the borough.

Torquay.—ELECTRICITY EXTENSIONS.—The Corporation has received sanction to extensions to its generating station at Newton Abbot and the provision of further plant. New boiler plant is to be installed, and the engineer has been instructed to submit a comprehensive scheme for bringing up-to-date the whole system of distribution in the Torquay district. The supply of electricity in bulk to Teignmouth is now in operation. The electricity generated during December showed an increase over the corresponding month of the previous year of 538,006 kWh.

Walthamstow.—LOAN.—The Urban District Council has applied for sanction to a loan of £9,950 for the installation of electric cookers on the housing estates.

Wetherby (Yorks.).—INAUGURATION OF SUPPLY.—An electricity supply for the district was inaugurated on February 1st. Electricity is supplied by the Yorkshire Electric Power Co.

Wigton (Cumberland).—ELECTRICITY SCHEME.—At a meeting of the Rural District Council on February 1st a communication was received from the Allerdale Coal Co. stating that it proposed to apply for powers to provide a supply of electricity for West Cumberland. The area to be covered would extend from Workington in the south-west to Maryport and Allonby in the north-west, and from Cockermouth in the south-east to Aspatria and West Newton in the north-east, the power station to be erected at Great Clifton. The Council is to await further details before giving its support to the scheme.

Wimbledon.—NEW PLANT.—The Electricity Committee is to apply for consent to the extension of plant by the addition of a 6,000-kW turbo-alternator, a new boiler, auxiliary plant and switchgear, at an estimated cost of £75,000.

Worthing.—LOAN.—The Electricity and Waterworks Committee has recommended to the Town Council that application be made for sanction to a loan of £51,640 for electricity extensions, including the installation of a 1,500-kW set at an estimated cost of £27,000.

Tramway and Railway Notes.

Argentina.—TRAMWAY AGREEMENT.—A new agreement has been entered into between the Société des Tramways de Rosario and the municipal authorities of that city, under which the period of the concession has been extended until the end of 1970. The Tramways Co. has undertaken to construct about 34 miles of new lines within the next two years.

Australia.—LAUNCESTON (TASMANIA).—The accounts of the city tramway undertaking (superintendent: Mr. R. J. Strike) for the year ended June 30th, 1926, record a total revenue of £47,974, as compared with £50,531 in the preceding year. Operating expenses amounted to £38,810, as against £35,460, leaving a gross profit of £9,164 (£15,071). Interest and sink-

ing-fund charges absorbed £9,213, and there was a net loss of £49, as compared with a surplus of £5,650 in 1924-25. The number of car-miles run increased from 463,718 to 492,395, but the number of passengers carried decreased from 4,573,275 to 4,486,587.

Bradford.—RAILLESS CARS.—The *Yorkshire Post* states that a proposal for the substitution of railless cars for tramcars has been made by the Tramways Committee and will be submitted to the Corporation in due course. Two years ago the Committee approved a proposal for the relaying of the tramway track from Four Lane Ends to Allerton at an estimated cost of £31,350, but on January 31st it approved a reduced estimate of £29,560 for the substitution of a railless-car system on the Allerton route.

Continental.—AUSTRIA.—Work is proceeding with the electrification of the Saalfelden-Worgl, Kufstein-Worgl, and Innsbruck-Brenner sections of the Austrian State Railways, and it is expected that electrical operation will commence by the end of the present year.

SWITZERLAND.—From Berne it is reported that work is shortly to be commenced on the electrification of the Berne-Neuenberg section of the Swiss Federal Railways.

Halifax.—TRACK RENEWAL.—The Finance Committee has approved a recommendation of the Tramways Committee to reconstruct the tramway track between King Cross and Cote Hill, at an estimated cost of £3,600.

London.—NEW "DISTRICT" LINE.—The *Financial News* states that at a meeting of the Seven Kings Ratepayers' Association on January 31st, the Mayor of Ilford stated that there was a possibility of the District Railway being extended from Barking to the Becontree estate. He said the L.C.C. had offered the necessary land free, and the District Railway Co. was in agreement with the scheme, but the sanction of the London Midland and Scottish Railway Co. had to be obtained before the extension could be made. The L.M.S. had been communicated with, but had not replied. The L.C.C. and the Ilford Council were of opinion that if the company did not give its consent the Government should take action.

FASTER TRAMCARS.—*The Times* reports that the Metropolitan Electric Tramways, Ltd., is introducing new tramcars fitted with higher-powered motors capable of a speed of 30 miles per hour. It is also proposed to eliminate a number of the existing stopping places. The new tramcars are being tried on the route from Paddington to Finchley, and it is intended to place similarly-equipped tramcars on the other routes of the system within the next few months.

Oldham.—ABANDONMENT OF ROUTE.—The Town Council has decided not to reconstruct the tramway track from the centre of the town to Lees, a distance of two miles. The tramway service on this route will be replaced by motor-omnibuses.

Walsall.—ABANDONMENT OF ROUTE.—The Town Council has decided to abandon the Walsall Wood tramway and to substitute an extended motor-'bus service. Application is to be made for sanction to the borrowing of £16,000 for the purchase of new motor-omnibuses.

Telegraph and Telephone Notes.

Bolivia.—NEW RADIO STATION.—A wireless station is to be erected at Lake Gaiba, in Eastern Bolivia, and the purchase completed of apparatus temporarily installed on the s.s. *Saavedra*. The Marconi Company, which holds a 25-year monopolistic contract for telegraph services in Bolivia, has undertaken to provide special apparatus for short-wave transmission.—*Reuter's Trade Service* (La Paz).

Poland.—NEW RADIO SERVICES.—Direct wireless communication has been opened between Poland and Syria, the Lebanon, Transjordania, Palestine, Egypt, Eritrea, and Abyssinia, and *vice versa*. Regular exchanges have been arranged between the central wireless station at Warsaw and the Orient Radio Co.'s station at Beyrouth.—*Reuter* (Warsaw).

India.—LONG-DISTANCE TELEPHONY.—The new telephone trunk line between Calcutta and Delhi is now ready for the use of the public. This, in conjunction with the trunk lines between Delhi and Bombay and between Delhi and Lahore, will enable Calcutta to be in direct telephone communication with Bombay and Lahore. The distance between Calcutta and Bombay *via* Delhi is well over 1,800 miles.

Irish Free State.—TELEPHONE CAPITAL BILL.—In Dail Eireann on January 26th Mr. Ernest Blythe, Minister for Finance, was given permission to introduce the Telephone Capital Bill, which is to grant further money for the development of the telephone system in the Free State. The Bill, in addition to moneys authorised by the Telephone Capital Act of 1924, will enable the Minister for Finance to issue out of the Central Fund such sums, not exceeding £500,000, as may be required by the Minister for Posts and Telegraphs for the development of the telephone system. He may borrow by means of terminable annuities extending over a period not exceeding 20 years.

Jersey.—TELEPHONE SERVICE.—The rent of a telephone in Jersey is only twopence a day, or roughly £3 a year, and calls cost a penny each. There are now 2,847 telephones on the island, or one to every 14 inhabitants, as compared with one to 29 in Great Britain. The Jersey telephone system has almost doubled since 1923, when the States purchased it from the Post Office; there were then only 1,600 telephones on the island.

The Telegraph Service.—PRESS TRAFFIC LOSS.—In the first and second reports of the Select Committee of Public Accounts, just issued by the Stationery Office, it is stated that the telegraph service has rarely if ever paid, and on the basis of the Post Office commercial accounts the losses in the last three years have been:—

1923	...	...	...	£1,697,000
1924	...	...	...	£1,271,000
1925	...	...	...	£1,645,000

The loss is attributed in part to the growing competition of the telephone service, especially for short-distance traffic, but an appreciable portion is undoubtedly due to the annual loss on Press telegraphy, which was estimated in June, 1907, apart from interest on capital, at about £250,000. On the same basis the loss for 1922-23 was estimated at about £360,000. Since then it has fallen, partly because the Press has adopted the policy of leasing telegraph lines, and is now put at about £230,000 a year. The Committee is "of the opinion that this position should not be allowed to continue."

Radio Notes.

Bulgaria.—PROPOSED NEW STATION.—A 5-kW transmitter to replace the present one at Sofia is contemplated; it will cost £30,000 and not be ready before the end of the year. Public subscriptions are to be invited at once by the Government.

China.—NEW STATIONS.—The contract for a 2-kW station, with a wave-length of 250 to 550 metres, for installation at Mukden, was awarded to a French firm. An American firm received the contract for the installation of a 1-kW station with a similar wave-length in Harbin. These two broadcasting stations should be in operation early in 1927, and a new market for receiving sets will be opened, says *Commerce Reports*, as the installation of receiving sets was previously prohibited, except for military purposes, in Manchuria outside of the South Manchuria railway zone. Receiving sets will be taxed and licensed according to type and size; the licence fee for crystal sets to be approximately $3 a year, valve sets $6 a year, and a tax of 10 per cent. *ad valorem*, in addition to the regular Customs duties, will be imposed on imported sets. Dealers in radio receiving sets will be licensed; a deposit of approximately $5 will be required of all dealers prior to the issue of the licence.

High-power Stations.—EUROPEAN CONFERENCE.—A conference of European wireless engineers will shortly be held under the auspices of the International Radio Union to examine the position of high-power European stations working on long wave-lengths. Russian delegates are expected to attend.—*Reuter* (Brussels).

New Zealand.—NEW STATIONS.—The installation of powerful broadcasting stations at Auckland and Christchurch has been completed by the Radio Broadcasting Co. of New Zealand, Ltd., a subsidised company organised to operate a chain of broadcasting stations throughout New Zealand on a uniform basis, says *Commerce Reports*. The Auckland station is already in service, and the stations at Christchurch, Wellington, and Dunedin soon will be installed. It is estimated that about 8,000 licences were issued in 1926. Practically all of the equipment used in this area is American.

United States.—BROADCASTING REVENUE.—Figures considered to be average in relation to the operation of broadcasting stations in the United States indicate that those who believe that to own a commercial radio station is to possess a "gold mine" may be disillusioned. "Time on the air" is sold for from $25 to $400 an hour, says *World Radio*, and the average is considered to be about $200 per hour. Few stations broadcast more than eight hours a day, and most of them no more than six. If six hours could be sold every day of the year at, say, the average rate of $200 per hour, which is unlikely, the revenue would be $438,000 annually. Most advertisers desire the time between the hours of 8 and 10 at night, and a station that averages one hour per day for 365 days considers it is doing well, which means an average income of $73,000 per year.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—SYDNEY.—April 6th. New South Wales State Railways. One 7,500-kW turbo-alternator. (B.X. 3179.)*

February 16th. One 100-kVA, 3-phase oil-insulated indoor-type transformer. (B.X. 3200.)*

February 21st. Municipal Council. 660-V cable. (B.X. 3200.)*

MELBOURNE.—February 21st. State Electricity Commission of Victoria. V.i.r. insulated control cable. (B.X. 3214.)*

April 5th. Postmaster-General's Department. Condensers. (B.X. 3215.)*

March 30th. Victorian Railways. Lightning arrestors. (B.X. 3213.)*

BRISBANE.—April 13th. Brisbane City Electric Light Co., Ltd. Transformers. (B.X. 3218.)*

Bedford. — February 28th. Electricity Department. Twelve months' supplies of e.h.p. and l.p. cables and incandescent electric lamps. (See this issue.)

Belfast.—February 18th. Electricity Department. Twelve months' supply of materials, including electrical accessories, lamps, carbon brushes, cables, &c. (January 28th.)

Belgium.—February 27th. Permanent Deputation of the Province of Limburg, Hasselt. Ten static transformers, &c. Service Provinciale d'Electricité, 27, Avenue Bamps, Hasselt (6 fr.).

Bexley.—Electricity and Tramways Department. One 1,400-kVA bank of Scott-connected transformers. Two 140-kVA single-phase induction regulators, e.h.p. and h.p. switchgear and cable connections. (February 4th.)

Bristol.—February 18th. Electricity Committee. Coal- and ash-handling plant, and railway sidings; circulating-water screening plant. (January 28th.)

Canterbury.—February 21st. Electricity Department. L.p. lead-covered and armoured feeder cables. (February 4th.)

Cardiff. — February 23rd. Electricity Department. Twelve months' supply paper-insulated cables. (February 4th.)

Croydon.—March 3rd. Electricity Department. 12,000 tons of coal suitable for use on chain-grate mechanical stokers. (February 4th.)

Dundee.—February 21st. Electricity Department. Two water-tube boilers with superheaters, economisers, mechanical stokers, and coal-handling plant. (January 28th.)

February 28th. Education Committee. Electrical installation for the new secondary school, Perth Road. Messrs. Thoms and Wilkie, architects, 21, South Tay Street, Dundee.

Eastbourne.—February 21st. Electricity Department. E.h.p. cable, static transformers, and e.h.p. switchgear. (January 28th.)

The Electricity Committee is inviting quotations for coal-handling plant, which is estimated to cost £1,150.

Eccles.—February 12th. Electricity Department. Two 500-kVA, 3-phase oil-cooled transformers. Borough Electrical Engineer, Cawdor Street, Patricroft.

Egypt.—CAIRO.—March 3rd. Ministry of Public Works. Two internal-combustion engines and accessories for the Egyptian Army Flour Mills, Tura, near Cairo. (A.X. 4187.)*

Hamilton.—February 14th. District Committee of the Middle Ward of Lanark. Electric lighting installation for Longriggend Sanatorium. Mr. P. C. Smith, architect, District Offices, Hamilton.

Harrogate.—February 28th. Electric lighting installation for St. Mark's Church, Leeds Road. Particulars from the Verger.

Huddersfield.—February 19th. Town Council. Electrician's work at maternity home, Greenhead Road. Borough Architect. 26, Ramsden Street.

Hull.—February 14th. Tramways Committee. Stores for 12 months, including car-lighting fittings, lamps, cable and switches, &c. General manager.

India.—February 18th. India Store Department. 100 miles insulated copper wire. March 1st. 300,000 insulators. (See this issue.)

Leeds.—February 18th. Electricity Department. Twelve months' supply of stores, including cables, boxes and fittings, jointing and insulating materials, &c. (January 28th.)

London.—SHOREDITCH.—February 23rd. Electricity Department. One 1,500-kW automatic sub-station converting equipment and one 20-ton electrically-operated overhead travelling crane. (January 28th.)

LONDON COUNTY COUNCIL.—February 14th. Electrical installations at the undermentioned schools:—Barrett Street Trade School Extension, Oxford Street, W., lighting, power, telephones, bells, &c.; County Secondary School, Eltham, S.E., lighting, power, telephones and bells; Crondall Street Elementary School, Shoreditch, lighting; Drayton Park Elementary School, Islington, lighting. (February 4th.)

H.M. OFFICE OF WORKS.—February 17th. Electrical accessories. (February 4th.)

METROPOLITAN ASYLUMS BOARD.—February 23rd. Carrying out the installation of electric lighting at Millfield, Rustington, near Littlehampton, Sussex. (February 4th.)

Long Eaton.—February 24th. Electricity Department. One 500-kW convertor set and one switchboard platform. (February 4th.)

Morley (Yorks.).—Electrical wiring and services for 48 Corporation houses on the Bradford and Wakefield Road site. Mr. F. Turner, borough engineer and surveyor.

New Zealand.—WELLINGTON.—March 4th. Poverty Bay Electric Power Board. Switchgear and transformers. (B.X. 3160.)*

April 26th. Public Works Department. Secondary battery for the Lake Coleridge scheme. (B.X. 3202.)*

February 12th. Department of External Affairs. Apia hydro-electric power scheme, Samoa. Transformers, lightning arresters, cable, &c. (B.X. 3200.)*

Newark-upon-Trent.—February 22nd. Electricity Department. Gasfilled electric lamps for street lighting for 12 months. (See this issue.)

Oldham.—February 14th. Town Council. Electrical installation for 302 houses, Greenacres and Boarshaw. Borough Engineer and Surveyor, Town Hall.

Peterborough.—February 28th. Electricity Department. One 12,000-kW turbo-generator, with foundations, condensers, air and extraction pumps, air cooler, oil cooler and pipework, e.h.p. switchgear, coal-handling plant, &c. (January 28th.)

Portsmouth.—Electricity Department. Coal-handling plant. (January 28th.)

South Africa.—JOHANNESBURG.—March 19th. Municipal Council. Transformers. (B.X. 3219.)*

March 3rd. South African Railways and Harbours. Overhead line material. (B.X. 3224.)*

Spalding.—February 26th. Urban District Council. 28 sets of centrifugal pumps (for sewage pumping), including electric motors, automatic starters, floats, valves, pipes, &c. Mr. C. F. Murphy, Lloyd's Bank Chambers, Morpeth.

Tilbury.—February 12th. Urban District Council. H.p. underground cables, l.p. distribution mains, house services, transformers, h.p. and l.p. switchgear and conversion of public street lamps. (January 28th.)

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*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Barking Town.—Special Urban District Council Committee. Recommended:—
Electrical apparatus for heating water and raising steam at baths (£2,647).—Bastian Meter Co., Ltd.
Filtration plant (£1,545).—Paterson Engineering Co., Ltd.

Electricity Committee.
Switchgear for River Road sub-station:—

Metropolitan-Vickers Electrical Co., Ltd. (Recommended.)	**£369**
New Switchgear Construction Co., Ltd. ...	376
English Electric Co., Ltd.	383
Ferguson, Pailin, Ltd.	418
Johnson & Phillips, Ltd.	429
Edison Swan Electric Co., Ltd.	441
General Electric Co., Ltd.	456
Crompton & Co., Ltd.	496
Bertram Thomas	507
British Thomson-Houston Co., Ltd.	616

Birkenhead.—Electricity Committee. Accepted:—
Transformer kiosk at Upton (£187).—Yorkshire Switchgear & Engineering Co., Ltd.

Doncaster.—Electricity Committee.
L.p. cables (£1,597).—Enfield Cable Works, Ltd.
Overhead travelling crane (£889).—Herbert Morris, Ltd.

Dumfries.—Electricity Committee. Recommended:—
Switchgear for Maxwelltown sub-station (£697).—Metropolitan-Vickers Electrical Co., Ltd.

Dundee.—Town Council. Accepted:—
Electric lighting installation at the new library at Broughty Ferry (£126).—Marshall, Hutton & Co.

Eastbourne.—Electricity Committee. Accepted:—
Turbo-generator (£13,954).—W. H. Allen, Sons & Co., Ltd.
Foundations (£665).—Peter Lind & Co.
Boiler (£15,726).—Vickers Boiler Co., Ltd.
Cooling tower (£1,897).—Premier Cooling & Engineering Co.
Cable (year's contract).—Craigpark Electric Cable Co., Ltd.

Glasgow.—Health Committee. Accepted:—
Electric cooking plant at Bellefield Sanatorium (£275).—Corporation Electricity Department.

Tramways Committee. Recommended:—
Supply of a coil winder.—Midland Dynamo and Motor Repairs Co., Ltd.

Heckmondwike.—Urban Council. Accepted:—
Installing electric lighting at houses on the Heaton House estate.—Butler & Horn.

Liverpool.—Electricity Committee. Recommended:—
One h.p. switch cubicle for the control of the new 25,000-kW alternator, with l.p. panels, main cables and small control wiring (£7,531).—Metropolitan-Vickers Electrical Co., Ltd.

London.—LONDON COUNTY COUNCIL.—Education Committee.
Wiring and fittings for electric lighting at Frankham Street school, Deptford:—

Alpha Manufacturing & Electrical Co., Ltd. (Recommended.)	**£400**
Anderson, Angell & Co.	419
A. Higginbotham & Sons	449
A. Meckhonik	466
A. Hawkins & Sons	469
Burdette & Co., Ltd.	540
Marylebone Electrical Stores	622
Douglas Electric Lighting & Power Co. ...	670

(The chief engineer's comparable estimate is £420.)

Wiring and fittings for electric lighting at Lomond Grove school, Camberwell:—

Anderson, Angell & Co., Ltd. (Accepted.)	**£327**
A. Dean & Co., Ltd.	324
Commercial Telephone Co., Ltd.	343
Commercial Lighting, Heating & Power Co.	359
Alpha Manufacturing & Electrical Co., Ltd. ...	373
G. E. Taylor & Co.	398
Smethurst & Co. (London), Ltd.	398
Bailey & Incledon, Ltd.	417
A. Higginbotham & Sons	430
Burdette & Co., Ltd.	440
A. Hawkins & Sons	449
F. W. Whymant	460
Marylebone Electrical Stores	533

(The chief engineer's comparable estimate is £350.)

ABERDEEN LINE (G. Thompson & Co., Ltd.).
Electric lamps.—Edison Swan Electric Co., Ltd.; British Thomson-Houston Co., Ltd.; Siemens and English Electric Lamp Co., Ltd.

ADMIRALTY.
Torch batteries.—Edison Swan Electric Co., Ltd.

New Zealand.—The Auckland Electric Power Board has placed a contract with the British General Electric Co., Ltd., for the supply of over half a million yards of triple-braided cable.

Plymouth.—Tramways Committee. Accepted:—
Turbine vacuum cleaner (£175).—Sturtevant Engineering Co., Ltd.
16 sets brake equipment (£2,212); magnet brake equipment for 15 cars (£1,185).—Westinghouse Brake and Saxby Signal Co., Ltd.

Electricity Committee. Accepted:—
Conduit.—Doulton & Co., Ltd.
Two l.p. transformer switches.—Switchgear & Cowans, Ltd.

Stoke-on-Trent.—Hospitals Committee. Recommended:
Installation of fire-alarm system at infectious diseases hospital (£209).—Associated Fire Alarms, Ltd.

Torquay.—Electricity Committee. Accepted:—
16,500 yd. cable for the Newton Abbot and Paignton ring main (£13,530).—Hackbridge Cable Co., Ltd.

Windermere.—Urban Council. Accepted:—
Wiring houses for electric lighting (£216).—Thornborough & Co.
Supplying and laying cables (£300).—Windermere and District Electricity Supply Co., Ltd.

Forthcoming Events.

Electrical Engineers' Ball.—Friday, February 11th. At the Hotel Cecil.

Electrical Trades Commercial Travellers' Association.—Friday, February 11th. Holborn Restaurant. 7.30 p.m. Annual dinner.

Electromobile Association.—Friday, February 11th. Royal Society of Arts. 7 p.m. "The Use of Storage Battery Type Electromobiles." Mr. J. C. Elvy.

Junior Institution of Engineers.—Friday, February 11th. London. 7.30 p.m. "The Physiology of Work Under High Air Temperature Conditions." Prof. K. N. Moss.
Friday, February 18th. 39, Victoria Street, S.W. 7.30 p.m. "Modern Concrete Construction." Mr. L. Turner.

Physical Society.—Friday, February 11th. Imperial College of Science, London. 5 p.m. Annual general meeting, and ordinary meeting to follow.

Royal Society of Arts.—Monday, February 14th. London. 8 p.m. Cantor lecture, "Photo Elastic Measurements of Stress Distribution." Prof. E. G. Coker, F.R.S.
Wednesday, February 16th. 8 p.m. "Some Studies in Connection with the Manufacture of Electric Lamps and Thermionic Valves." Mr. C. C. Paterson.

Electrical Association for Women.—Tuesday, February 15th. King's College for Women, Campden Hill, W. 5.15 p.m. "How the American Housewife Solves Her Household Difficulties." Mrs. C. Frederick.

National Association of Supervising Electricians.—Tuesday, February 15th. Chalmers House. 7.15 p.m. Annual general meeting.

South Wales Institute of Engineers.—Tuesday, February 15th. Royal Metal Exchange, Swansea. 6 p.m. "The Romance of Copper." Mr. Ll. B. Atkinson.

Batti-Wallahs' Society. — Wednesday, February 16th. Hotel Cecil. Luncheon. Sir Duncan Watson on "The Prospects of the Electrical Industry."

Institution of Electrical Engineers.—Thursday, February 17th. London. 6 p.m. "Stability of Large Power Systems." Mr. F. H. Clough.

(Western Centre). — Wednesday, February 16th. Museum and Arts Gallery, Bristol. 7 p.m. Faraday Lecture, "What is Electricity?" Prof. W. M. Thornton.
Monday, February 14th. South Wales Institute of Engineers, Cardiff. 7 p.m. "Power Stations and Their Equipment." Mr. W. M. Selvey.

(North-Eastern Centre).—Monday, February 14th. Sopwith's Café, Newcastle-on-Tyne. 7 p.m. Discussion, "The Problem of Rural Supplies."

(North-Western Students' Section).—Tuesday, February 15th. 7.30 p.m. At Queen's Hotel, Manchester. Smoking concert.

(Mersey and North Wales (Liverpool) Centre).—Wednesday, February 16th. At The Temple, Dale Street, Liverpool. Joint meeting with the Liverpool Engineering Society.

(South-Midland Centre). — Wednesday, February 16th. University, Birmingham. 7 p.m. "33,000-V Cables with Metal-sheathed Cores, with Special Reference to the S.L. Types." Mr. P. Dunsheath.

(Sheffield Sub-Centre).—Wednesday, February 16th. Mappin Hall, Sheffield. "Application of X-rays to the Examination of Metals." Dr. E. V. Pullin.

(Irish Centre, Dublin).—Thursday, February 17th. Trinity College, Dublin. 7.45 p.m. "History of Telephone Transmission." Mr. J. D. Ferguson.

Meter Engineers' Technical Association.—Thursday, February 17th. Lighting Service Bureau. 7 p.m. "Meter Testing Methods and their Relationship to Output and Accuracy." Mr. C. W. Pike.

Royal Institution.—Thursday, February 17th. 5.15 p.m. "Acoustical Problems—Bells." Sir Wm. Bragg.

Edinburgh Electrical Society.—Thursday, February 17th. Royal Scottish Society of Art. 8 p.m. "Electric Light as Applied to the Home." Mr. H. E. Hughes.

British Electrical Development Association.—Friday, February 18th. Royal Society of Arts. 7.30 p.m. "Assisted Wiring Schemes." Mr. W. F. T. Pinkney.

Notes.

Fire Alarms at Lytham.

A new fire alarm system is contemplated at Lytham St. Annes, and the Ministry of Health is being asked to sanction a loan of £1,200 for the purpose. Messrs. Carter & Co. (Nelson) are the inventors of the system, which consists of a series of boxes containing loud-speaking telephones. When the alarm is given and the glass is broken, a door automatically flies open, and reveals the telephone whereby direct information can be given.

Lectures.

On Wednesday last Mr. R. P. Howgrave-Graham, M.I.E.E., was to give a lecture demonstration of high-frequency oscillating currents, at pressures up to half-a-million volts, in aid of the Penge and Anerley Philanthropic Society, at the Town Hall, Anerley.

The Principal of East London College (University of London) informs us that owing to illness Mr. J. H. MORRELL will be unable to deliver the proposed course of six lectures on "Short Electric Waves" during the present term. It is hoped that he will be able to do so next term.

A Large Electrically-Controlled Bridge.

What is described as the largest bascule lift bridge of its type provided with an elaborate electrical protective system to ensure safe operation, the Roosevelt Avenue Bridge, will soon be completed across the Flushing River to Flushing, Long Island, New York. This new structure will have a double deck and will carry the Manhattan subway trains across the river. Two movable leaves turn upon huge trunnions and open like the blades of a knife to permit the passage of ships, each leaf being 152 ft. long. So delicately is this great weight counterbalanced, however, that four 80-h.p. electric motors can open or close the bridge in 45 seconds against a pressure equal to a 25-m.p.h. wind. The motive power is provided by Westinghouse motors of 328 total h.p. Special attention has been given to ensuring complete safety in the operation of the bridge. When a ship wishes to pass beneath, it signals the bridge operator, who signals to the towerman controlling the operation of the trains that he wishes to open the bridge. The towerman then sets the signals against the trains, and this operation automatically energises the bridge's motive power circuits, permitting the bridge operator to start up the motors, which perform a series of functions necessary for the opening of the bridge. The system is so arranged that each step in the process of opening or closing the bridge must be taken in exactly the right order, and no step can be taken until the previous one has been properly completed. A signal light on the operator's desk at the controllers indicates the proper performance of each step. Should anything jam or should power fail, everything becomes locked in position, so that no part of the mechanism can "run wild." The total cost of the bridge and its approaches is $2,700,000.

Educational.

EAST LONDON COLLEGE, ELECTRICAL ENGINEERING DEPARTMENT.—A course of five lectures on "High-Voltage Insulation, Particularly the Application of Micanite and Varnish-paper Materials," by Mr. A. Collins, will be delivered on Mondays commencing February 21st, at 6 p.m. (See our advertisement pages to-day.)

Electrically-driven Artificial Silk-Spinning Machines.

Constant effort is being made to improve the method of application of the electric drive to artificial silk-spinning machines, and in view of the increasing use of this class of plant in all parts of the world, the following notes with regard to a machine introduced by Messrs. Ramesohl & Schmidt, of Westphalia, are of interest. The Westphalia electrically-driven centrifugal spinning machine, as it is called, has flexible bearings to compensate for uneven loading of the coiler can when running at high speeds. The rotor of the motor is carried on a tubular shaft running in ball bearings. The spindle carrying the coiler can is supported within this shaft, and also by an additional spring-loaded ball race. This flexible bearing serves to damp out any vibration set up by the coiler can; thus the rotor and practically all the rotating mass runs smoothly. The spindle of the rotor being vertical, the least possible load is put on the bearings, thus reducing the friction to a minimum.

The lubrication is carried out in a novel manner. The bottom part of the casing forms an oil container, and an extension of the hollow spindle of the rotor projects into the oil. On account of the high speed of rotation, the oil rises up this spindle till it reaches the flexible bearing, which is thus well lubricated, as are also the springs which carry it, and the rotor bearing immediately below. The surplus oil is collected by means of a disk placed immediately under the upper bearing of the rotor, and is conducted past an inspection window back to the sump *via* the bottom conical bearing of the rotor. The proper functioning of the lubrication system can therefore be observed from the outside at any time. The solidly-constructed bearings of the machine enable the clearance between the stator and the rotor to be reduced to a minimum; therefore the efficiency is extremely high, while the speed remains constant and the slip is very small.

Starting the machine is effected either by means of an ordinary switch or by a special form of starting switch, which also enables a quick stop to be obtained by reversing two phases of the circuit. The machine is driven by a.c., and the speed depends upon the frequency; as this is usually insufficient in the ordinary way, a secondary circuit with higher frequency is provided in order to obtain the speed desired. This higher frequency is obtained by means of a frequency changer. A slip-ring rotor is driven by a motor, and has the available a.c. supply current fed into the stator, so that the rotor is driven against the field thus set up, and from the slip-rings of the rotor the secondary current of higher frequency is taken to drive the spinning machine; or the primary current may be fed into the rotor through the slip-rings, the secondary current being taken from the stator.

A High-pressure Steam Turbine in Operation.

The Milwaukee Electric Railway and Light Company has started operation of a 7,000-kW steam turbo-generator which uses steam at a pressure of 1,200 lb. The 3,000-kilowatt turbo-generator in the Edgar station of the Edison Electric Illuminating Company, of Boston, Mass., U.S.A., also operates at 1,200 lb. pressure. Both are of General Electric design and manufacture. The Milwaukee turbine receives steam at a pressure of 1,200 lb., superheated to 720 deg. F. It exhausts at 320 lb., the steam being conducted at this pressure to the station mains serving several 30,000-kW machines where more of its energy is extracted. The final exhaust is at one inch absolute.

A pressure of 400 lb. is now common in central stations, with some operating well above this figure; 600 lb. is, however, the maximum, except in the cases of these two 1,200-lb. machines. As recently noted, Mr. Thos. Roles is installing a 1,200-lb. set at Bradford.

Two-fluid Boiler Systems.

Diphenyl oxide, a white chemical with a powerful odour like strong geranium scent, is being used in one boiler to run an engine, and the exhaust vapour from that engine, still very hot, to raise steam from ordinary water in a second boiler, according to Dr. H. H. Dow, a manufacturing chemist of Midland, Mich., U.S.A. Dr. Dow has been experimenting with the system for some months, and states that it has proved itself quite successful and very economical of fuel.

The idea was tried first with mercury as the liquid in the first, or high-temperature boiler, but its great weight and considerable initial expense, together with constant losses, interposed engineering and economic difficulties. Further, leakage of mercury vapour is almost certain to be injurious to the workmen, because mercury is exceedingly poisonous. For these reasons, therefore, Dr. Dow sought for a liquid that is light, cheap, and non-poisonous, and still has a large capacity for carrying heat over into the second boiler to generate steam for the second engine.

A number of organic chemical compounds were found to possess these qualities, but at the temperatures used in boilers they tended to break up into other compounds useless for power purposes and to clog the boilers with carbonaceous materials of no use for carrying heat. Diphenyl oxide, however, has been used and condensed and used over again many times at a pressure of 200 lb. per sq. in. and a temperature of 800 deg. F., with but little deterioration. It weighs little more than water, as contrasted with mercury, which is heavier than lead. Its price is only 30 cents a lb. in quantity lots, which, according to Dr. Dow, makes its cost, volume for volume, less than two per cent. of that of mercury. The compound has been produced hitherto in comparatively limited quantities, because its only use has been in the perfume industry, but Dr. Dow states that there is no limit to the bulk that can be manufactured if it is desired for power plant uses.—*Science.*

High-Power Street Lighting.

The seven blocks of State Street, which lies within Chicago's "Loop" district, often alluded to as the most concentrated shopping district in the world, may now be described as the world's greatest "White Way" as the result of the installation of what is claimed to be the most powerful street-lighting system ever built. This intensive lighting system was financed by the State Street merchants, who estimate their aggregate sales at approximately $1,500,000 a day. It is said that the street is now fully three times brighter than any other in the world, and compares favourably with the lighting in many stores and factories. The light is furnished by 70 "Union" metal standards, placed ten to a block, five on each side of the street, each equipped with G.E.C. fittings containing 2,000-W "Mazda" lamps, said to be the largest ever used for street-lighting purposes.

Fatality.

Herbert Cunliffe, employed in the moulding shop at Messrs. S. S. Stott's Laneside Foundry, Haslingden, on February 3rd received a fatal electric shock whilst assisting a fitter to drill a plate by means of a portable electric drill.

Train Collision Report.

The official report on the inquiry into the circumstances of a derailment and collision which occurred on November 30th at Crofton South Junction, Wakefield, on the L.M. and S. railway, has been issued. It appears that the derailment was caused by the breaking of a brake pull rod of the running engine, and the broken end of the rod striking a sleeper. There were two fractures, and one had at some time been electrically welded, but left in an unsatisfactory manner, and it is held that this was partially responsible for the final collapse of the rod. It is pointed out that the men engaged on the electric welding have attained a considerably higher degree of skill than was at first shown, recent testing by cutting through the joint showing in all cases a satisfactory repair, and that so long as this can be ensured, the practice of electrically welding fractures of the kind is not open to objection.

Storage Batteries in Gassy Mines.

A new use for storage batteries is foreshadowed in the United States. Writing in the American *Mining Congress Journal*, Mr. Graham Bright, a consulting engineer, of Pittsburgh, states that it is only recently that storage-battery power has been used in coal-mining operations in any part except in "gathering" the coal. The element of safety obtained by the use of storage-battery equipment has, however, opened up the possibility of extending the use of the battery in gassy mines to practically all underground power requirements, including haulage, cutting, drilling, auxiliary pumping, and ventilation. This would eliminate wires from the mine except at the charging stations. It is stated that battery power has been successfully applied to haulage and cutting operations in the Phelps Dodge Company's mines in New Mexico, and the Consolidation Coal Company's mines in West Virginia.

Electricity on Japanese Farms.

The Japanese Minister of Communications has decided to grant credits to agricultural societies for the purchase of electrical machinery which will assist them in their farming operations. Only 5½ per cent. interest will be charged on the sums advanced. Several agricultural groups in the prefectures of Aichi, Osaka, and Hyogo have already received advances amounting to £26,000 from an *ad hoc* committee. The first purchase by the Aichi prefecture consisted of 53 motors intended for the drying and treatment of rice and seeds. The electrical distribution systems are accordingly being extended. The Commercial Attaché expresses the view that this installation of modern equipment on comparatively small farms constitutes an important step in the development of Japanese agriculture. It is thought that the movement will considerably extend.

Research at Birmingham.

The Joint Standing Committee for Research of the University of Birmingham reports that in the Department of Electrical Engineering work on the following subjects is now being done:—The characteristics of the electric arc, investigated in the research into the transmission of power at high frequencies which is proceeding; the conduction of currents by electrolytes; and the testing of a.c. machines by means of direct current.

Water Power versus Diesel Engines in Bulgaria.

A few years ago the idea of "the electrification of the whole of the country" by means of hydro-electric stations was very popular in Bulgaria, and the State advanced considerable sums to water syndicates and corporations founded in many parts of the country. It has been necessary, however, to moderate many dreams, for most of the rivers in Bulgaria are almost dry in summer, and on an average not more than 1,000,000 hydraulic h.p. is available. It is evident that encouragement must be given to towns which confine themselves to obtaining the power for their electric lighting and local industries from the rivers in the valleys where they are situated. During the last few years many power stations have replaced their steam engines by Diesel (or other) oil engines and use liquid fuel in place of coal. Prof. Danailov has protested in the Slovo against this practice; he points out that Bulgaria is rich in coal still to be exploited, while she has no native liquid fuel. She is therefore obliged to purchase it abroad, to the great detriment of her balance of trade and the quotation of the lev; the professor concludes, therefore, that it is necessary to place heavy import duties on Diesel engines and foreign liquid fuels entering Bulgaria.

In reply, Engineer B. Radev says that it is true that many Bulgarian towns use modern Diesel engines, these being the most practical and economical; indeed, in many towns they are the only possible means of producing electric light. These towns number fourteen at present and possess about 300,000 inhabitants, or 75,000 families. Statistics show that each provincial family in Bulgaria consumes for lighting purposes an average of about 60 kilowatt-hours a year, so that the 75,000 families consume annually about 4,500,000 kilowatt-hours; in order to produce this total, it is necessary to use about 1,600,000 kilograms of liquid fuel at a price of two or three leva a kilogram, making a total of about 3,700,000 leva; the cost of about 35,000 kilograms of lubricating mineral oil used (about 500,000 leva) must be added to this figure. Apart from these fourteen large central electricity stations belonging to the municipalities, there exist in Bulgaria many other privately-owned electricity stations which use Diesel engines. Furthermore, eighteen other Bulgarian towns or co-operative companies have decided to introduce electric lighting into their districts in 1927, and they will also use Diesel engines; 250,000 inhabitants, forming 62,000 families, will profit when electricity replaces paraffin in these districts. If high import duties were placed on imports of Diesel engines, mineral oils and their products, many families would probably be obliged to return to the use of the paraffin lamp, which would add considerably to the money spent abroad by Bulgaria on paraffin. M. Radev concludes that in Bulgaria the *rôle* of the State should not consist in favouring any one category of electric power stations, but in leaving each organisation to choose for itself the system it finds most profitable in view of the special conditions in the locality. The only thing the State ought to do, he says, is to demand of each new municipal electrical enterprise to make its choice in such a way that from the first, or second, year of its working it is able to meet expenses, to pay interest on the capital invested, and provide an annual redemption sum, or be deprived of all credit or other form of encouragement from the State.—*Reuter's Trade Service* (Sofia).

Coal Mines: Certificates of Competency.

The Board for Mining Examinations, with the approval of the Board of Trade, has made rules for the qualifications of applicants for certificates of competency under the Coal Mines Act, 1911. An applicant must be at least 23 years of age, and must submit to the Examining Board testimonials and certificates of his preliminary qualifications, as specified. He must satisfy the Examining Board that he has had practical experience in mining for not less than five years (or not less than three years if he holds an approved degree or diploma), and must pass written and oral examinations. The rules made by the Board for Mining Examinations in August, 1919, are revoked, and the new rules will come into operation on March 1st, 1927. Copies can be obtained from H.M. Stationery Office, price 1d. net.

Advertising Electricity by Films.

With the object of attracting more customers for electricity supply in rural areas, the Bernische Kraftwerke Gesellschaft, Berne, is showing in the principal villages in the canton a film depicting the uses of electricity in agriculture.

Photo-telegraphy.

A service for the exchange of pictures between Austria and Germany by wireless telegraphy will, it is hoped, be inaugurated before long. The Königswusterhausen station in Germany is to serve Rosenhügel as the return station during the preliminary experiment. The public service will be in the hands of the Austrian Marconi Co. (Radio Austria), and the Austrian Broadcasting Co., says *The Times*, will include within its range Great Britain and all other countries willing to co-operate. The system adopted by Austria deals with photographs and graphic reproductions of every kind, 4 in. square.

The tests which are being undertaken by the Austrian Marconi Co. jointly with the Telefunken Gesellschaft, of Germany, which it is hoped will lead to the establishment of a public service for the exchange of news and pictures, will extend over a considerable period. The experiment will be in connection with the Karolus-Telefunken-Siemens system. Tests made last year yielded good results, but only one-way, and were therefore inconclusive.

The results of the first Transatlantic experiments in the transmission of pictures and writing in facsimile by the system have now become available in Europe. Messages of acknowledgment from Rio de Janeiro and Buenos Aires showed that, in spite of atmospheric difficulties, the images were received there with encouraging clearness. Two certified facsimiles were reproduced in *The Times* (of London) on January 28th, which explains that though most of them were rather plainly marked with the vertical lines characteristic of facsimiles received under experimental conditions and some showed slight distortion, the pictures were, on the whole, remarkably clear, and print and script passed the essential test of legibility. The Telefunken Gesellschaft is fully satisfied with the results of this 6,000-mile transmission from the Nauen wireless station to Rio; in view of the atmospheric disturbances there was some doubt whether the images would get through at all. Transmission to Rio was begun on a wave-length of 40 metres, but owing to atmospheric disturbances a change was made to 25 metres. The time taken was from five to ten minutes, compared, it is stated, with 1½ hours required by other systems which have been tried over long distances. A transmitter is being built for the Rio station, and is nearly completed. Short-distance transmission in Europe is regarded as almost past the experimental stage. The average rate of transmission between Berlin and Vienna on the 1,300-metre wave-length is 30 seconds.

Electrical Association for Women.

The first of a series of evening lectures arranged by the above Association for women working in the industry and domestic-science mistresses was given by Mr. J. W. Beauchamp, director, Electrical Development Association, at the Lighting Service Bureau, London, on January 26th. In a very clear and lucid manner Mr. Beauchamp dealt with the history and economics of electricity supply in this country. He also gave an interesting description of the geography of the electrical world, and referred to the principal developments which would take place under the new Electricity Supply Act.

On February 8th Mr. W. E. Bush delivered the second lecture, on "Electric Light in the Home and in the School."

The following lectures have been arranged for: February 18th, "Household Engineering and Efficiency Tests," by Mrs. Christine Frederick (U.S.A.); March 9th, "Simple Household Repairs"; March 23rd, "Electric Power Appliances in the Home"; and April 6th, "Women's Place in the American Electrical Industry," by Mr. T. Settle. All the lectures will take place at 7 p.m.

Miss Reynard, M.A., Warden of King's College for Women, has kindly placed the Lecture Hall of this College at the disposal of the E.A.W. for February 15th, at 5.15 p.m., when Mrs. C. Frederick will lecture on: How the American housewife solves her household difficulties. A limited number of tickets for this lecture are obtainable from the director, E.A.W., 26, George Street, Hanover Square, W.1.

Electricity in Gasworks.

After a brief mention of the uses of pneumatic, hydraulic, and gas power, the applications of steam in a gasworks with an output of more than 15 million therms per annum were detailed in a paper which Mr. H. C. Smith recently brought forward for discussion at the Institution of Civil Engineers. The steam generated on an average day is at the rate of 44,110 lb. per hour from and at 212 deg. F., or 16,718 h.p. The efficiency of transmission of energy from heat in steam to b.h.p.-hr. is 3.5 per cent., which low figure is due to the fact that steam is used in a large variety of scattered units, the majority of which have been in use for several years under non-condensing conditions. The generation and use of electric power in gasworks is dealt with: the efficiency of generation from heat in steam supplied to engines to heat in electricity generated is 10.1 per cent., and the efficiency of generation and transmission from heat in steam supplied to engines to brake-horse-power developed by works motors is 6.1 per cent., which is comparable with the efficiency of 3.5 per cent. given for the use of steam power. Of the 16,718 h.p. of steam generated, 2,647 h.p. is used for gas-making and purposes other than power, and 14,071 h.p. for power purposes; of the latter, 1,524 h.p. is converted into electrical energy, giving 147.8 h.p. of electricity. The author suggests that in designing new gasworks of a similar size to the one under review power would be most economically produced and applied as electricity, generated by steam at a central station, the bulk of the steam being produced by waste-heat boilers; it would then all be used at one point, the exhausts of engines discharging into suitable condensing plant. Assuming that the mean total power required in new works would be the same as in the existing works, 494.0 b.h.p. would be required per average day; if applied as electricity with an efficiency from steam to motor of 6.1 per cent., it would be necessary to generate only 8,098 h.p. of steam instead of 14,071 h.p. as at present; plant capable of generating 818 h.p. or 610 kW would be required, with which a higher efficiency should be obtained than with the 150-kW plant now in use and, assuming this to be 14 per cent., the steam required would be only 5,843 h.p. The saving in steam would amount to 233 tons per diem, which, at 25.3d. per ton, gives a saving of £8,963 per annum, and it is shown that it would be possible to make 83 per cent. of the steam required in the works for gas-making and power purposes (apart from that necessary for the working up of by-products) in waste-heat boilers under average day conditions. Under existing conditions it would only be possible to make 42.1 per cent. of the steam required from the waste heat of the various carbonising processes.

Further Swiss Railway Electrification.

The electrification of the Federal Railways in Switzerland is now bringing before the directors of the secondary lines the desirability of electrifying their railways. The first of these to change its form of traction will probably be the "Directe," a line that unites Berne and Neuchâtel, the traffic of which is seriously threatened by the electrification of the section of the C. F. F. Berne-Bienne and Bienne-Neuchâtel. It is estimated that a sum of 6,800,000 fr. will be required for the project. The Confederation is authorised to advance one-half of this sum, the other half to be provided by the three cantons interested in the scheme, *viz.*, Berne, Neuchâtel, and Fribourg. The Confederation demands that the present situation of the "Directe" must be rendered satisfactory before the loan can be advanced, and the directors have accordingly made certain proposals. It is hoped, therefore, that the work will be put in hand soon, and that the line will be running electrically at the beginning of 1928. The energy needed for the railway will be furnished by the Muhleberg power house of the Forces Motrices Bernoises, and the line will be electrified in the same manner as the Federal Railways. The preparatory labour necessary for giving the supply is already in hand, which will prove a distinct gain of time when once the real work is undertaken. Four electric locomotives and five motor coaches will be used on the line, and a considerable speeding-up of the time-table will be the welcome result, while the saving on the cost at present paid annually for coal will be no less than 375,000 francs.

Fires and Electric Shocks.

The *Birmingham Post* quotes some suggestions for minimising the risks of electric shocks made by the Chief Officer of the Birmingham Fire Brigade (Mr. A. R. Tozer) in a circular issued recently.

It is pointed out that the risks from the 220- and 440-volt systems in houses and shops are accentuated by the adoption in large factories and works of the high-pressure system. Mr. Tozer is anxious to make arrangements which will be satisfactory to users, and at the same time safeguard, to some extent, members of the brigade who may receive a fire call. With the permission of firms, he is willing to place indication plates beside the main doors to premises, and suggests a 6-in. enamelled plate bearing the letters "H.T." Where there is only one entrance red letters on a white ground would, he considers, be suitable, and where there is more than one entrance black letters on a white ground, with the red-lettered plate by the nearest entrance to the electrical control room. On the arrival of the brigade, these plates would give warning of the high-pressure installation, and, if necessary, the Electric Supply Department could be summoned at once to cut off the supply to the works.

Where premises are locked up at night without any person in attendance, it would greatly help the brigade if the electrician were to cut off the current at the distributing board. It is stated that at a number of fires recently Birmingham firemen have received shocks.

A New Mica Insulation.

Phthalic anhydride, a few years ago a chemical curiosity produced from naphthaline or moth balls, has been combined with glycerine to produce a synthetic resin to replace shellac as a binding material in the manufacture of pasted mica insulation or micanite. The resin, which has been developed by the General Electric Company of America, is known as "Glyptal," and has been standardised for use with all rigid mica insulation used in the apparatus made by the company. Experiments have shown that mica plates pasted with the new resin are not only more firmly bonded, but have several other advantages over shellac-pasted plates. It is claimed that the Glyptal-pasted material has from 10 to 60 per cent. more dielectric strength, twice the resistivity, four times the surface resistivity, and only two-thirds the dielectric loss. It is slightly denser, has about twice the transverse strength, and has about the same resistance to abrasion. It shows very little tendency to carbonise, and the products of decomposition do not attack copper, and are non-conducting. An advantage in the use of the new mica insulation is that it does not require new or additional equipment to that used heretofore for micanite insulation. Glyptal can also be used in the manufacture of flexible mica sheets, mica tape, and so on.

Appointments Vacant.

Five transmission line engineers (£400) for the Shannon Hydro-Electric Scheme; high-pressure cable jointer for the Tunbridge Wells Corporation Electricity Department; junior mains assistant for the Borough of Dover Electricity Department; chief clerk (£230), mains foreman (95s.) for the Corporation of Middleton Electricity Department; clerk of works (£250) for the Millom Urban District Council; assistant engineer (£200 +) for the Park Prewett Mental Hospital, Basingstoke; meter tester and repairer for the Borough of Haslingden Electricity Department; showroom manager, wireless correspondent and estimator, order clerk and correspondent, trade counter salesman and storekeeper, for Metro-Vick Supplies, Ltd.; engineer, Consumers' Department (£1,200) for the Perak River Hydro-Electric Power Co., Ltd.; three shift engineers for the Salt Union, Ltd., Runcorn. (See our advertisement pages to-day.)

E.P.E.A. Dinner.

The annual dinner of the Scottish Division of the Electrical Power Engineers' Association was held at Edinburgh on February 5th. Mr. H. J. Taylor, chairman of the division, presided over a company of 80. Councillor Couston, sole convener of Edinburgh Corporation Electricity Committee, proposed the toast of the "Electricity Supply Industry," and in reply Mr. R. B. Mitchell, chief electrical engineer, Glasgow Corporation, referred to the trade revival, which had been quite marked in Glasgow since the beginning of the year, and said that the output figures were very encouraging. He did not think that large undertakings like those of Edinburgh and Glasgow would benefit very materially from the Electricity Act, but the smaller undertakings would. They had bright prospects. The manufacturers of electrical plant had been very busy during the past year, in spite of all that had happened, and they now had their order books very full, more so than since the war.

Mr. Edwin Seddon, chief engineer of the Edinburgh Corporation Electricity Department, gave the toast of "The Association," and Mr. A. W. Crompton, Newcastle, the president, responded.

Institution Notes.

Institution of Electrical Engineers.

NORTH-WESTERN STUDENTS' SECTION.—A dance will be held at the Manchester Municipal College of Technology on Saturday, March 5th. Tickets (4s. 6d. each) can be obtained from members of the Committee or from the hon. secretary.

The Physical Society.

During the year 1926 fourteen ordinary meetings were held, at which 32 papers were presented and 12 demonstrations were given. The average attendance was 54. At the sixteenth annual exhibition trade exhibits were arranged by seventy-two firms, and the Research and Experimental Section contained sixty-one exhibits. On the third day the general public were admitted, and the total attendance at the exhibition was estimated at 3,500. The Council has awarded the Fourth Duddell Medal to Mr. F. Twyman, F.R.S. The new agreement between the Society and the Institution of Electrical Engineers in respect of "Science Abstracts" has been sealed, and is regarded by the Council as satisfactory. The Council has decided to take no formal action in the matter of changing the name of the Society; the words "of London" are to be omitted from all publications except where legally necessary. The number of Honorary Fellows on the roll on December 31st, 1926, was 12, the maximum permissible number. At the same date Ordinary Fellows numbered 666 and Students 12, the net increase being 23.

The annual general meeting is to be held to-day. It will be followed by an ordinary meeting, at which the presidential address will be given by Prof. O. W. Richardson, M.A., D.Sc., F.R.S., on "The Present State of Atomic Physics."

The twelfth Guthrie Lecture will be delivered on Friday, February 25th, by Prof. Sir Ernest Rutherford, O.M., D.Sc., P.R.S., on the subject of "Atomic Nuclei and their Transformations."

INSTITUTE OF PHYSICS.—On the resignation of Prof. A. W. Porter from the honorary secretaryship, Prof. A. O. Rankine, of the Imperial College of Science, has been appointed his successor. Mr. Thomas Martin, M.Sc., D.I.C., has been appointed secretary of the Institute. The office of the Institute of Physics has been transferred from 90, Great Russell Street, to 1, Lowther Gardens, Exhibition Road, London, S.W.7.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

The Electricity Board.—On Monday last the Minister of Transport announced that he had appointed the undermentioned to fill the seven places on the Central Electricity Board under the chairmanship of Sir Andrew Duncan:—

Sir James Devonshire, K.B.E., M.I.E.E., chairman and general manager, the North Metropolitan Electric Power Supply Co. and allied companies. Vice-president Incorporated Association of Electric Power Companies.

Mr. Frank Hodges, J.P., secretary, International Miners' Federation.

Sir James Lithgow, Bart., M.C., T.D., D.L., J.P., ex-president of National Confederation of Employers' Organisations.

Alderman W. Walker, M.I.E.E., M.I.M.E., vice-chairman, Manchester Corporation Electricity Department. Chairman of National Joint Industrial Council for the Electricity Supply Industry and chairman of National Joint Board of the Electricity Supply Industry.

Sir Duncan Watson, J.P., M.I.E.E., chairman of the London and Home Counties' Joint Electricity Authority. Chairman of the Conference of Joint Electricity Authorities, Joint Advisory Boards and Joint Committees.

Mr. W. K. Whigham, director, Bank of England, and member of the Trade Facilities Act Advisory Committee.

Brevet-Colonel the Hon. Vernon Willey, C.M.G., M.V.O., C.B.E., director Lloyd's Bank, late Controller of Wool Supplies, Ministry of Munitions, and ex-president of the Federation of British Industries.

Eastbourne Electricity Committee recommends increasing the salary of the electrical engineer (Mr. J. K. Brydges) from £900 per annum to £1,000.

Mr. W. THYNE, late of Glasgow, has been appointed district manager of the Canterbury telephone district in succession to Mr. A. M. Kidd, who recently retired.

Mr. K. D. CAMPBELL, late sales manager of the Campbell Gas and Oil Engine Co., Ltd., Halifax, has been appointed to a similar position with Petters (Ipswich), Ltd.

The Southport Town Council has adopted a recommendation by the Finance Committee disapproving of a proposal by the Electricity Committee that Mr. W. T. GANN should be appointed deputy electrical engineer at the salary fixed by the E.P.E.A. schedule. An amendment that the appointment be made was negatived by a small majority. Mr. Gann has been first assistant at the electricity works for three years.

The *Yorkshire Post* says that at a meeting of the Hull City Council last Friday a motion to increase the salary of the city electrical engineer was defeated by 27 votes to 15.

Mr. MOXON, electrical engineer, has been awarded £100 by the Southport Council for his services as fuel overseer during the coal strike.

The *Australian Electrical Times* states that Mr. J. G. KILPATRICK, supervising engineer in the Central Administration, P.M.G.'s Department, Melbourne, has been provisionally appointed State engineer for Western Australia in place of Mr. PETER KENNEDY, who has been promoted to South Australia. Mr. Kilpatrick has been attached to the Department's engineering staff since 1915, and has previously had 14 years' experience with the engineering branch of the British Post Office.

On Monday the Newark Town Council appointed Mr. A. J. WARING, A.M.I.E.E., distribution electrical engineer to Torquay Corporation, as borough electrical engineer.

The accompanying portrait is that of Mr. J. SCRIVENER, who is, as we recently reported, managing director of Volta, Ltd., which is handling a new suction cleaner of Swedish manufacture. During the past seven years Mr. Scrivener has been associated with a well-known company specialising in vacuum cleaners, as managing director. He has therefore had a good

Hugh Cecil] **Mr. J. Scrivener,** *[London.*

Managing Director of Volta, Ltd.

deal of experience in this particular direction. Mr. Scrivener informs us that although his company has only been functioning for three or four weeks, he is very gratified by the response made by the trade. As soon as the machine is reasonably well distributed throughout the country, the company is undertaking a national advertising campaign.

Mr. HAROLD PARKER has resigned his position as sales manager to Messrs. S. G. Leach & Co., Ltd., London, and has been appointed assistant manager to Walter's Electrical Manufacturing Co., Ltd., of Kensaltown Telegraph Works, Kensal Road, London, W.10. The latter company was established in 1880 as contractor for telegraph instruments, railway signalling apparatus, &c. Mr. Parker was for eight years in India and the Far East, connected with the Metropolitan-Vickers Electrical Co., Ltd.

The British Thomson-Houston Co., Ltd. (Lamp Sales Department) announces that in future Mr. F. E. BING will be representing the company for "Mazda" lamps in the place of Mr. A. H. Cooling, who has left the service.

Major G. FETHERSTONE resigned his appointment as British Trade Commissioner in South Africa in order to take charge, as from February 1st, of the South African interests of the group of engineering firms controlled by Agricultural and General Engineers, Ltd.

Mr. L. J. N. KIRKBY has been appointed assistant mains engineer to the City of Chester electricity department.

The Spalding Urban Council has appointed Mr. R. J. CALDERWOOD, gas and waterworks engineer, as manager of the new electricity department, at a salary of £100 per annum.

By the casting vote of the Mayor, Middleton Town Council has increased the salary of the electrical engineer from £500 to £600 per annum.

At a meeting of the Society of Technical Engineers on February 7th, Capt. W. J. LIBERTY was awarded the Society's "Nersey" premium for a paper on the "History of Artificial Lighting."

Obituary.—MR. W. S. BEMROSE.—The death occurred suddenly, on February 3rd, of Mr. William Scofield Bemrose, who for about 48 years had been in business as an electrical engineer at Rochester. He was in his 75th year, and since his retirement about two years ago the business has been managed by his son, Mr. J. Bemrose, A.M.I.E.E., and other relatives.

MR. G. H. FAWCUS.—We learn with regret of the death of Mr. George Henry Fawcus, A.M.I.E.E., chief engineer and manager of the Altrincham Electric Supply Co., Ltd. Mr. Fawcus, who was born in 1879, received his training under Messrs. Siemens Bros. & Co., Ltd., at Woolwich, and before taking up his position with the Altrincham company he was connected with various power and traction undertakings, including the Waterloo and City Railway, the Blackpool, St. Annes and Lytham tramways, also the Blackburn and Bath tramways. During the war Mr. Fawcus rendered service in connection with the Ministry of Munitions and Coal Mines Control.

SIR WILFRID STOKES.—We regret to record the death, which occurred on Monday last at the age of 66 years, of Sir Wilfrid Stokes, the well-known engineer and the inventor of the Stokes gun. He will be remembered by our readers as one of the early presidents of the British Engineers' Association and a very active and valued member of the Inventions Branch of the Ministry of Munitions during practically the whole of the war. Sir Wilfrid was also a vice-president of the Federation of British Industries.

MR. C. BROOKER.—The death took place, on January 28th, at the age of 57 years, of Mr. Charles Brooker, who had for nearly 20 years been on the staff of the Marconi Wireless Telegraph Co. at Chelmsford.

SIR JAMES KEMNAL.—On Tuesday morning Sir James Kemnal, M.I.E.E., managing director of Messrs. Babcock & Wilcox, Ltd., who had been ailing for some time, died at Bournemouth. The funeral takes place to-day.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Dormer & Wadsworth, Ltd.—Private company. Registered January 31st. Capital, £1,000 in £1 shares. Objects: To adopt an agreement with Engineering Supplies, Ltd., and to carry on the business of general engineering tool makers, formerly carried on by that company at 57a, Denbigh Street, Pimlico, and that of electrical and radio engineers, &c. The first directors are:—H. A. Dormer, 18, Westcliff Parade, Westcliff-on-Sea (director of Engineering Supplies, Ltd.); L. H. Wadsworth, Mount Lodge, Upland Road, Sutton, engineer. Qualification: £100. Remuneration, as fixed by the company. Secretary: G. Dickson, 11, Queen Victoria Street, E.C.4. Solicitors: Tatham, Oblein & Nash, 11, Queen Victoria Street, E.C. Registered office: 57a, Denbigh Street, Pimlico, S.W.1.

J. L. Maughan & Co., Ltd. — Private company. Registered February 2nd. Capital, £1,000 in £1 shares. Objects:—To carry on the business of electrical, mechanical, and wireless engineers, manufacturers of, and dealers in electrical apparatus, cables, wires, conduits, accumulators, batteries, motors, generators, mining machinery and apparatus, lamps, accessories, &c. The subscribers (each with one share) are:—J. Maughan, Look Out Farm, Seaton Delaval, grocer; J. Maughan, Junr., 43, Bywell Terrace, Seaton Sluice, electrical engineer. The first directors are not named. Secretary: J. Maughan, Junr. Solicitors: Keenlyside and Forster, Lloyd's Bank Chambers, Collingwood Street, Newcastle-on-Tyne.

Charnock & Walker, Ltd.—Private company. Registered February 4th. Capital £500 in £1 shares. Objects: To carry on the business of manufacturers and patentees of electric, clockwork, novelty and sky signs, wireless lights and other signs, advertising contractors, &c. The permanent directors are:—J. E. Charnock, Little Hey, Pirbright, consulting engineer; D. D. Walker, Ravensknowle, Springfield Drive, Westcliff-on-Sea, advertising expert. Qualification £100. Secretary: J. E. Charnock. Solicitors: Marcus and Francis, 47-48, Broad Street Avenue, E.C.2.

Howarth, Green & Co., Ltd. — Private company. Registered February 3rd. Capital, £1,000 in £1 shares. Objects:—To carry on the business of importers and exporters of electrical goods, &c. The first directors are:—F. T. Green, J. W. Green, W. V. Green, and J. Green, all of Staveleigh House, Knott End, near Fleetwood. Secretary: F. T. Green. Solicitor: E. Napthen, 18, Winckley Square, Preston. Registered office: 12a, Starkie Street, Preston.

A. & C. Receivers, Ltd.—Private company. Registered February 5th. Capital, £100 in £1 shares. Objects:—To carry on the business of manufacturers of, and dealers in all kinds of apparatus, instruments, receiving or transmitting sets, electrical or mechanical parts, fittings and appliances, and all cabinet and other work connected with radio-telegraphy, &c. The subscribers (each with one share) are:—F. H. A. Gittins, Priory Street, Dudley, accountant; F. W. Mail, 214, Bordesley Green, Birmingham, radio mechanic. The first directors are not named. Secretary: F. H. A. Gittins. Solicitors: Loxton & Co., 15, Bridge Street, Walsall. Registered office: 12, Mountrath Street, Walsall, Staffs.

Official Returns of Electrical Companies.

Western Wireless and Electrical Co. (Salisbury), Ltd.—Particulars filed of £1,500 debentures authorised January 27th, 1927, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,300.

Rhondda Tramways Co., Ltd.—Satisfaction to the extent of £7,400 on January 13th, 1927, of charges dated March 24th, 1911, November 13th, 1912, and May 11th, 1915, securing £250,000.

Radio Communication Co., Ltd.—Satisfaction to the extent of £66,000 on January 28th, 1927, of debenture dated April 14th, 1926, securing £81,500.

City of Oxford Motor Services, Ltd. (formerly City of Oxford Electric Tramways, Ltd.).—Satisfaction to the extent of £1,800 on January 13th, 1927, of charge dated February 20th, 1914, securing £46,000.

Santon, Ltd.—Charge on 149 and 150, Dock Street, Newport, dated January 14th, 1927, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd., not exceeding £1,800.

Brundall and District Service Co., Ltd. (195,956).—Capital, £4,000 in £1 shares. Return dated October 29th, 1926. All shares taken up. £3,750 paid. £250 considered as paid. Mortgages and charges, nil.

English Cable Supplies, Ltd. (195,754).—Capital, £2,500 in £1 shares. Return dated August 18th (filed October 2nd), 1926. 465 shares taken up. £465 paid. Mortgages and charges, nil.

City Notes.

Yorkshire Electric Power Co.

The accounts which will be submitted at the annual meeting at Leeds, on February 15th, are as follows:—

	1924.	1925.	1926.
	£	£	£
Net profit after payment of interest and debenture stock discount charges	182,764	205,012	257,416
Balance brought forward ...	34,640	46,053	55,051
Total	£217,404	£251,065	£312,467

The dividend on the cumulative preference capital of 6 per cent. (less income tax) absorbs £59,615; a dividend on the ordinary capital at the rate of 8 per cent. (less income tax) (of which 3 per cent. was paid in August) amounts to £102,592; £60,000 is to be placed to general reserve, increasing

the fund to £294,000; £25,000 is to be put to plant renewals fund (increasing it to £75,000); and £65,260 is to be carried forward. Owing to the coal dispute and the general strike the cost of supplying electricity was greatly increased, but the increased revenue and economies made have enabled the company to pass satisfactorily through a very difficult period. There has been a large increase in the number of agreements made with new and old consumers and, granted the restoration of normal trade conditions, a considerable increase of output may be anticipated. Large extensions of mains have been made and many sub-stations built and extended. These new mains include important additions to the 33,000-volt transmission system, enabling the company to deal with the increasing demands for electricity in the most economical way. The Thornhill and Barugh power stations have been fully employed, and the new plant installed at Thornhill is effecting the economies anticipated. The completion of the initial installation of 50,000 h.p. at Ferrybridge power station during the year was delayed by the contractors' difficulties in obtaining materials. The machinery has since been set to work and is now in operation. In February last, 773,000 six per cent. cumulative preference £1 shares were allotted to the shareholders at 21s. each and applied for nearly twice over. A Bill has been deposited in Parliament to authorise the increase of the nominal capital of the company from £4,000,000 to £6,000,000, with power to borrow on mortgage or by the issue of debenture stock up to one-half the total capital. "The Electricity (Supply) Act, 1926, received Royal Assent in December last, after amendments had been made to the Bill originally introduced, which may, it is hoped, make it a workable measure, but some time must necessarily elapse before the scheme of the Central Electricity Board can be brought into operation."

Fife Tramways, Light and Power Co., Ltd.

The report for the year ended December 31st, 1926, states that the trading profits of the undertakings owned and operated by the company amounted to £75,606. Of this sum there was reserved in the accounts of these undertakings an aggregate amount of £10,169. After payment of this company's administration expenses, taxation, &c., there remains at credit of profit and loss account (including £9,694 brought forward) £64,043. Loan interest and interest on debenture stock absorbs £17,409, dividend on preference shares £24,000, and there is transferred to debenture stock redemption account £4,488, leaving £18,145. The directors recommend a dividend on the ordinary shares at the rate of 3 per cent. per annum, less tax, £12,000, leaving £6,145 to be carried forward. The earnings of the power and lighting properties were seriously affected by the complete dislocation caused by the coal dispute in the county of Fife. The working costs and output of these properties are now almost back to normal conditions. The Power Company's generating station is being interconnected with the adjoining undertaking of the Scottish Central Electric Power Co. by a trunk transmission line, which will be completed early in the current year, and a supply in bulk will be given to that company.

Speaking at the annual meeting on February 4th, Mr. Wm. Low (chairman) said that the company had now distribution powers for lighting as well as for power purposes over the whole of the county of Fife, with the exception of the burghs of Kirkcaldy and St. Andrews. It was the intention of the directors to extend the network of mains into the new area during the current year and to commence supply in districts from which urgent demands had been received.

Prospectus.

North Metropolitan Power Station Co., Ltd.—This company was formed to undertake, *inter alia*, the construction of the new Brimsdown power station for the North Metropolitan Electric Power Supply Co. On Monday last it issued a prospectus offering for subscription £850,000 of 5 per cent. debenture stock (at £100 10s. per cent.), representing the whole of the company's capital, with the exception of 100 shares of £1 each. This issue is guaranteed as to principal and interest by the Government under the Trade Facilities Acts, and is redeemable over the years 1931 to 1937 by a cumulative sinking fund operating by annual drawings and/or purchase. The list was to close on or before Wednesday last, but it actually closed at 3.30 p.m. on the day of issue.

An interesting section of the prospectus was that relating to the contracts which have been placed. The contract for "the construction and co-ordination of works" has been awarded to the Foundation Co., Ltd. Other contracts mentioned were:—Turbo-generators and condensing plant (£148,570), C. A. Parsons & Co., Ltd.; part of Foundation Co.'s contract (£71,321), International Combustion, Ltd.; 33,000-V outdoor switchgear and protective equipment (£14,350), Ferguson, Pailin, Ltd.; 11,000-V switchgear (£5,575), A. Reyrolle & Co., Ltd.; transformers (£7,890), British Electric Transformer Co., Ltd.; circulating-water pumps (£5,666), W. H. Allen, Sons & Co., Ltd.; and coal-handling and storage plant (£20,033), Babcock & Wilcox, Ltd.

Traction and Power Securities Co., Ltd.

The annual meeting was held last week. Mr. H. A. Vernet (chairman), who presided, said that a valuation of the company's investments showed them to be £96,000 above the book cost. The net revenue had increased and, in addition to transferring £10,000 to reserve, they had decided to pay an ordinary dividend of 14 per cent., as against 13 per cent. for 1925. After referring to the brighter prospects, the chairman said that, although the company was originally a finance company, it had become an investment trust. Accordingly, the directors proposed to change its title to "The Traction and General Investment Trust, Ltd." The report was adopted and the change of name approved.

Stock Exchange Notices.

The undermentioned have been ordered to be officially quoted:—

Chili Telephone—30,000 shares of £5 each, fully paid, Nos. 150,001 to 180,000.

North Wales Power—£200,000 four and a-half per cent. guaranteed debenture stock, 1930-53.

German Electrical Companies.

The net profits of the A.E.G., which, as mentioned last week, were 10,760,000 marks for 1925-26, compared with 8,363,000 marks in the previous year. The dividend is to be 7 per cent., as compared with 6 per cent. in 1924-25.

The Bank for Electrical Securities of Berlin, which is a financing organisation of the A.E.G. group, intends to increase its share capital by £434,000 to £1,210,000, for the purpose of participating in new business. It is said that the additional funds are to serve for the financing of electricity works abroad, as the work of erecting new stations in Germany is now so far under public control that little room is left for private enterprise.

Yorktown and Blackwater Gas and Electricity Co.

At the recent annual meeting, the chairman (Ald. D. Sparvell) said that the profits for the year enabled the directors to declare dividends of 12½ per cent. and 8¾ per cent. upon the original and additional shares respectively. The revenue from the sale of electricity had increased from £3,754 to £6,266. Their supply, which was received from London, was sold at a favourable rate to consumers.

Marconi's Wireless Telegraph Co., Ltd.

The membership of the Advisory Committee which has been appointed to report upon the future control and conduct of this company, and has been approved by the directors, is as follows:—Sir Hugo Hirst, Bart.; Lord Ashfield; Lord Buckland; and Mr. F. A. Szarvasy. The first meeting was to be held on Monday last.

Chatham and District Light Railways Co.

The revenue for the year ended December 31st last was £73,040 and the expenses £60,048. After providing for depreciation, rent, &c., and adding £1,596 brought forward, there is a balance of £5,362. It is proposed to pay the preference dividend and one of 2½ per cent. on the ordinary shares, leaving £962 to be carried forward. Meeting: February 17th.

Mexican Light and Power Co., Ltd.

It is reported that the board has prepared a funding scheme for the payment of the arrears of interest upon the company's second mortgage bonds and the discharge of the arrears of dividend upon the 7 per cent. preferred stock. The plan will be presented to the stockholders at an early date.

Shawinigan Water and Power Co.

A *Reuter* dispatch from Montreal states that the company has exchanged the old shares of $100 par value for new shares of no par value, on the basis of four new shares in exchange for one old share.

Crossley Bros., Ltd.

Dividend of 3½ per cent. on the preference shares, making 7 per cent. for the year.

Stocks and Shares.

MONDAY EVENING.

THE outstanding financial feature of the present time is the manner in which investment absorbs all the good stock offered. No matter from what quarter the appeal for capital comes, it finds a ready response, provided the security is sound, and that the price asked is in accordance with the general level occupied by similar issues. Money is pouring into stocks and shares in a volume which suggests that trade is less resilient than some of the authorities claim, for capital should be going into industrial channels, rather than into Stock Exchange securities, if there were actually such re-awakening of national industry as Bank chairmen, for example, have been talking about at the recent meetings of proprietors. China is a factor of restraint to some extent, but, apart from causing an occasional spasm of depression, the Far Eastern news does not weigh very heavily.

It has been generally understood that no more loans made under the Trade Facilities Act would be issued. This week, however, there have appeared prospectuses of T.F.A. stocks for a railway in Sudan, and £850,000 in 5 per cent. debenture stock of the North Metropolitan Power Station Company. Both were offered at 100½, and carry, of course, the guarantee of the Imperial Government.

Mexico has gladdened the hearts of her creditors by remitting the sum due for meeting interest obligations for 1926. This brought about substantial rises in the utility companies' bonds and shares. Mexican Light & Power preferred has jumped 12 points, and the common 6½. The bonds of the various concerns are 1 to 2 points higher. The feeling is that Mexico, having given this tangible evidence of her intention —as well as ability—to keep faith with her bondholders, it is reasonable to expect a just settlement of the amounts outstanding between the utility companies and their debtors. A more cheerful sentiment is now prevailing than has been the case for a long time past, although the cynic may possibly recall that Mexico has provided many a disappointment by shattering hopes which previously have appeared to be on the point of fulfilment.

Brazilian Tractions keep steady around 118. Brussels and Montreal continue to be ready supporters of the shares on any decline, but the recent excitement in the market has given place to quieter conditions. British Columbia Electric Railway stocks are again harder, the deferred gaining 4½ points. Colombo Electric Tramways & Lighting Company is said to have received, and refused, an offer from the Ceylon Government for the purchase of its plant and distributing system. The Ceylon Government was prepared to pay £250,000. The Company's 5 per cent. first mortgage debenture is quoted about 88, and stock changed hands last week at 89.

While Metropolitan Railway ordinary has rallied a little, after its steep fall on the dividend disappointment, other Tube railway stocks are heavy. Districts shed 1½, and Undergrounds have drooped. The Metropolitan announces that, in order to cope with its ever-increasing traffic, new arrangements are in contemplation for the installation of a huge additional power unit at Neasden. This has encouraged the hope that last year's poor dividend of 3 per cent.—as compared with 5 per cent. for 1925—was due to the coal stoppage and other industrial conditions which should not recur. A slight demand for London United Tramways debenture served to advance the price 3 points, to 45½; on the other hand, London and Suburban preference fell back to 6s. 6d. British Electric Traction hardened to 145½.

Of debenture stocks that are obtainable in the market, mention may be made of City of London Electric fives at 99½, free of stamp and fee, January and July interest, and exceedingly well-covered; North Metropolitan Electric Power fives at 97; London Power fives at 98¾, free of stamp. English Electric 6 per cent. convertible debenture can be bought at 102, to give a flat yield of £5 17s. 6d. per cent. on the money. The conversion terms are that until July this year a £100 debenture can be exchanged for 100 ordinary shares; until July, 1930, for 90 ordinary; and until 1933 for 80 ordinary shares. Perak River Hydro-Electric Power 7 per cent. debenture, which carries participating rights, is obtainable at 93, to yield £7 12s. per cent. Interest on this stock is payable, we may repeat, out of capital during construction of the works. A small amount of Llanelly and District Electric 5 per cent. first mortgage debenture stock is available at 93½, to give £5 6s. 9d. now and 5½ per cent. taking redemption into account. Interest payments are due in January and July.

Bournemouth and Poole ordinary have developed a little activity around £3. Both Bournemouth and Poole have recently issued Corporation loans, and apparently this has revived the expectation that the Electric Supply Company may receive an offer for its undertaking. Improvement in Primitiva Gas shares is ascribed to the desire on the part of the electric lighting authorities to obtain possession of the gas companies' mains for use in conjunction with the supply of electric current to the town. Several English provincial electric power shares are better. Newcastle-on-Tyne ordinary and Yorkshire Electrics are 6d. up. The latter company proposes to seek powers for raising its capital to £6 000,000. County of London ordinary improved a shade, but City Lights have gone back. There is nothing much doing in the market for shares in the London lighting list. New Shropshire A shares are being marketed this week at 25s. 3d.

Henleys are again 1/16th up, at 4½, and the yield on the money is now a shade under 4½ per cent. Brush shares are better at 28s. 3d. The weakness of British Aluminium is still noticeable, the price going back a florin to 46s. 3d. Telephone Manufacturing are a dull market at 7s. 7½d. Siemens' reverted to 30s. Coal and iron shares continue depressed, and the rubber market is in an uninteresting state.

Cable stocks and shares lean to the lower side. Anglo-Americans and Great Northerns being down on the week. Eastern Telegraph ordinary lost 2. Oriental Telephones and United River Plates went back 1/16th each. Marconis attract attention—and a wide diversity of dealings—upon publication of the names of an advisory committee of which Lord Ashfield and Sir Hugo Hirst are amongst the members.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. 1924.	Dividend. 1925.	Price Feb. 7 1927.	Rise or fall.	Yield p.c
Bournemouth and Poole	£1	14	14	£0 9	—	4 13 0
Brompton Ordinary	1	10	10	25/-	—	5 13 0
Charing Cross Ordinary	1	15	15	26/-	—	5 13 0
do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	13	13	25/-	—	5 13 0
City of London	1	15	15	2⅛	—⅛	... ...
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	28/6	—	5 13 4
County of London	1	15	15	28/-	+6d	... ...
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	8	26/8xd	—	6 2 0
do. 7% Pref.	1	6	7	23/-	—	6 1 9
Elec. Supply Corporation	1	10	10	30/6	—	6 11 2
Kensington Ordinary	1	15	15	24/-	—	5 16 8
Lancs. Light and Power	1	7½	7½	24/-	—	6 2 5
London Electric	1	10	10	24/-	—	5 17 8
do. do. 6% Pref.	1	6	6	5⅞	—⅛	5 10 4
Metropolitan	1	11	11	26/-	—	5 7 8
do. 4½% Pref.	1	4½	4½	17/-	—	5 2 10
Midland Counties	1	5½	6	21/-	—	5 14 8
Newcastle-on-Tyne Ordinary	1	7		20 6	+6d	6 16 7
do. 5% Pref.	1	5	5	17/6	—	5 14 8
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	24/-	—	5 16 6
South London	1	15	15	24/6	—	6 3 0
South Metropolitan Pref.	1	7	7	1¼	—	6 3 0
Urban Ordinary	1	4	7	1⅛	—	5 17 11
do. 6% Pref.	1	6	6	20/6	—	5 17 1
Westminster Ordinary	1	15	15	24/6	—	5 14 8
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	26/9	—	7 8 9
Yorkshire Elec.	1	8	8	22/-	+6	6 14 4

HOME RAILS.

Central London Ord. Assented	Stock	4	4	70	—	5 14 4
Metropolitan	,,	5	5	61½	+1	4 18 4
do. District	,,	3½	3½	55	—1½	6 7 3
Underground Electric	£1	Nil	Nil	12 6	—6d	Nil
do. do. Income	Bonds	6	6	103	—1	£5 16 4

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	100	—½	6 0 0
do. Def.	,,	1½	1½	24	—½	6 5 0
Automatic Telephone	1	8	10	2½	—	8 12 9
Chili Telephone	5	5	6	6½	—	4 12 4
Cuba Sub. Ord.	10	5	5	7	—	7 5 6
Eastern Extension	10	10	10	17⅜	—	£5 13 4
Eastern Tel. Ord.	Stock	10	10	172½	—2	£5 16 0
Globe Tel. and T. Ord.	10	10	10	18⅜	—	£5 6 8
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	22	20	26½	—½	7 11 0
Indo-European	25	6½	10	4¢½	—	£5 7 6
Marconi	1	10	Nil	15/-	—	... ...
Marconi-Marine	1	10	7½	1⅛	—	6 13 4
Oriental Telephone Ord.	1	12	12	1⅜	—⅛	£5 1
United R. Plate Tel.	5	8	8	8⅞	—⅛	£5 17
Western Telegraph	10	10	10	17	—	£5 17

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref.	5	5½	5½	2¼	+⅛	9 11 6
do. do. 2nd Pref.	5	5	5	2¼	—	10 8 8
do. do. 5% Deb.	Stock	5	5	60½	—1	7 4 0
British Electric Traction Ord.	,,	7	8	145½	+1	5 10 0
do. do. 6% Pref.	,,	6	6	109	—	5 10 1
Brazil Traction	100	4	5	118	+1	5 1 8
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	88½	—1	5 13 0
do. do. Preferred	,,	9/6/-	136/9	124½	+1½	£5 0
do. do. Deferred	,,	129/6	8	158½	+4½	£5 1
do. do. Deb.	,,	4½	4½	81½	+1	5 4 4
London & Sub. Trac. 5% Pref.	1	2½	Nil	6/6	—6d	Nil
London United Tram. Deb.	Stock	4	4	45½	+3	8 16 0
Mexico Trams, 5% Bonds	—	5	5	65½	+1½	7 12 8
Mexican Light Common	100	Nil	Nil	40	+6½	Nil
do. Pref.	100	Nil	Nil	92½	+12	Nil
do. 1st Bonds	—	5	5	65½	+1	7 12 8
Yorkshire (West Riding)	1	5	—	10/-	—2/6	... ...

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	12	12	53/9	—	4 16 8
British Aluminium Ord.	1	5	10	46/3	—2/-	4 6 7
British Elec. Transformer Pref.	1	Nil	7	18/6	—	7 12 7
British Insulated Ord.	1	15	15	70/-	—	4 5 9
Brush Ord.	1	10	10	28/3	+9d.	7 1 7
Callenders	1	15	15	3½	—	4 5 9
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 1
Crompton Ord.	1	Nil	Nil	10/-	—	... ...
Edison-Swan	£/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	84	—	5 19 1
Electric Construction	1	10	10	81/3	—	6 8 0
Enfield Cable Pref.	1	7½	7½	1½	—	6 6 4
English Electric	1	5	Nil	15/-	—	... ...
do. do. Pref.	1	6	6	17/6	—	5 17 5
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	5	7½	31/6	—	4 15 3
Henley	1	18	20	4½	+⅛	4 9 0
do. 4½% Pref.	5	4½	4½	4£	—	5 6 0
India-Rubber	1	5	5	1	—	£5 0 0
Johnson & Phillips	1	10	17½	2¼	—	5 19 1
Met.-Vickers Ord.	1	8	8	28/3	—	5 13 3
do. Pref.	2	8	8	9½	—	6 18 4
Siemens Ord.	1	7½	7½	30/-	- 6d.	5 0 0
Telegraph Construction	12	20	10	29½	—	£4 9 8

Dividends paid free of Income Tax.

The Import Trade of China.

THE present situation in China gives the following statistics a topical interest; they are, moreover, a guide to the trend of trade. The effects of the political and industrial disturbances which commenced in 1925 are clearly indicated by the preponderance of decreases shown in the last column of our table. It is noteworthy that machinery for electric power stations continued its upward course; the shares of Great Britain and Japan advanced, while that of the United States was almost halved. It is probable that a great deal of the trade credited to Hong-Kong was transacted with the United Kingdom. The Haikwan tael fell in average value from 3s. 7 15/16d. in 1924 to 3s. 5¼d. in 1925.

Country whence imported.	1924. Taels. (thous.)	1925. Taels. (thous.)	Inc. or dec. Taels. (thous.)
Brass and yellow metal; bars, sheets, wire, &c.—			
	1924.	1925.	Inc. or dec.
Total	1,526	1,377	− 149
Hong-Kong	553	305	− 248
Great Britain	96	59	− 37
Japan	671	911	+ 240
Belgium	14	14	—
United States	3	11	+ 8
Germany	168	72	− 96
France	—	7	+ 7
Copper bars, rods, sheets, plates, nails, and wire.—			
Total	1,063	923	− 140
Hong-Kong	39	41	+ 2
Great Britain	91	90	− 1
Japan	758	617	− 141
Germany	159	38	− 121
Belgium	8	1	− 7
United States	6	128	+ 122
Electrical materials and fittings.—			
Total	8,195	6,890	−1,305
Hong-Kong	647	421	− 226
Great Britain	1,236	1,199	− 37
Italy	81	65	− 16
Japan	2,171	2,367	+ 196
Canada	7	14	+ 7
United States	1,215	851	− 364
Sweden	13	14	+ 1
Belgium	315	123	− 192
Holland	367	283	− 84
France	52	122	+ 70
Germany	2,171	1,393	− 778
Machine tools.—			
Total	455	221	− 234
Great Britain	34	22	− 12
Denmark	1	2	+ 1
Japan	132	61	− 71
United States	177	59	− 118
Germany	71	44	− 27
Belgium	28	21	− 7
Propelling machinery, such as boilers, turbines, &c.—			
Total	1,963	1,920	− 43
Great Britain	1,041	892	− 149
Japan	90	93	+ 3
United States	271	296	+ 25
Sweden	282	65	− 217
Germany	164	275	+ 111
Belgium	52	281	+ 229
Italy	48	13	− 35
Telegraph and telephone material.—			
Total	1,053	958	− 95
Hong-Kong	39	45	+ 6
Great Britain	323	194	− 129
Japan	124	255	+ 131
Canada	2	6	+ 4
United States	77	76	− 1
Sweden	252	118	− 134
Germany	222	167	− 55
Belgium	4	8	+ 4
Scientific instruments and apparatus.—			
Total	1,237	988	− 249
Great Britain	101	128	+ 27
Germany	323	228	− 95
Belgium	10	4	− 6
France	25	29	+ 4
Japan	357	321	− 36
United States	281	203	− 78
Machinery for electric power stations.—			
Total	808	858	+ 50
From Great Britain ...	224	345	+ 121
,, Germany	222	167	− 45
,, Japan	5	105	+ 100
,, United States ...	208	113	− 95

The Import Trade of Siam.

THE following figures, showing the imports of electrical and similar goods into the port of Bangkok during the year ended March, 1926, are taken from the recently-issued official trade statistics; the figures for the year ended March, 1925, are included for the purposes of comparison, and notes of any increases or decreases are given. Imports stated to be from Singapore and Hong-Kong are for the most part the products of other countries shipped *vid* these two ports:—

	1924-25. Ticals. (Thousands.)	1925-26. Ticals. (Thousands.)	Inc. or dec. Ticals. (Thousands.)
Electrical goods and apparatus.—			
Total	796	819	+ 23
From United Kingdom ...	279	240	− 39
,, Germany	127	115	− 12
,, United States	119	100	− 19
,, Singapore	19	19	—
,, Sweden	22	22	—
,, Italy	23	3	− 20
,, Holland	22	32	+ 10
,, France	22	42	+ 20
,, Japan	86	102	+ 16
Lamps.—			
Total	591	575	− 16
From Singapore	88	51	− 37
,, Hong-Kong	46	20	− 26
,, United Kingdom ...	80	65	− 15
,, United States	37	41	+ 4
,, Japan	76	103	+ 27
,, Germany	203	250	+ 47
,, Sweden	45	31	− 14
Scientific instruments and apparatus.—			
Total	249	283	+ 34
From United Kingdom ...	77	48	− 29
,, Germany	32	87	+ 55
,, France	10	8	− 2
,, Japan	39	57	+ 18
,, United States	35	30	− 5
Prime movers, other than locomotives, marine, military, and agricultural machinery.—			
Total	165	296	+ 131
From United Kingdom ...	75	166	+ 91
,, United States	6	31	+ 25
,, Germany	32	51	+ 19
,, Denmark	6	1	− 5
,, Sweden	—	27	+ 27
Machine tools.—			
Total	186	136	− 50
From United Kingdom ...	71	45	− 26
,, United States	46	23	− 23
,, Denmark	6	39	+ 33
,, Germany	55	27	− 28
Machinery, unenumerated, including detached parts, and not including agricultural, textile, or sewing machines.—			
Total	1,765	717	−1,048
From United Kingdom ...	602	337	− 265
,, Japan	4	12	+ 8
,, United States	102	105	+ 3
,, France	27	34	+ 7
,, Denmark	810	32	− 778
,, Germany	139	131	− 8
Railway material.—			
Total	1,949	877	−1,072
From United Kingdom ...	154	47	− 107
,, Belgium	357	75	− 282
,, France	1,417	686	− 731
Cars or trucks for railways or tramways.—			
Total	241	942	+ 701
From United Kingdom ...	202	235	+ 33
,, United States	32	57	+ 25
,, Belgium	4	200	+ 196
Rubber manufactures, other than tires.—			
Total	374	508	+ 134
From Singapore	279	392	+ 113
,, United Kingdom ...	50	46	− 4
,, United States	15	23	+ 8
,, Japan	4	7	+ 3
,, Germany	9	20	+ 11

NOTE.—Tical = 1s. 10½d.

A Cathedral Lighting Scheme.

The electrical installation in the St. Magnus Cathedral, Orkney Islands.

IN our issue of March 14th, 1924, reference was made, in the description of the generating station at Kirkwall, Orkney Islands, to the intention to install electric lighting in the fine old St. Magnus Cathedral, fig. 1. This work has now been completed and we are able to give below some particulars of the scheme.

Fig. 1.—St. Magnus Cathedral, Kirkwall.

The lay-out of the building is on the usual cross design, with main, triforium, and clerestory arcades. As is always the case in installing electric lighting in such buildings, the antiquity of the structure and the ecclesiastical associations presented difficulties not met with in everyday work. Every effort has been made to obtain harmony with the surroundings, so that the clash between the 12th and 20th century products is minimised as much as possible.

Fig. 2.—Nave and Clerestories, Illuminated.

The nave lighting is arranged by means of 16 four-light fittings suspended from the centre of the main arches, eight on each side. The fittings are of circular design, and are placed about 12 ft. from the floor level. They each contain four 60-W lamps arranged on two different circuits. Rod suspension is employed for the fittings, and is carried out by a special bayonet catch arrangement to save the making of joints and facilitate the taking up and down of the fittings for cleaning purposes. The arrangement in the choir is exactly similar to that in the nave. A 13-light electrolier is provided over the nave and transept junction at about 30 feet above the floor level. The lamps are arranged in two tiers of six, with one lamp serving as a pilot light on the top of the fitting. This is controlled either from the main switchboard or from the entrance door, so that some light in the building may be obtained independently of the main switches. Each of the transepts is lit by four three-light fittings of semicircular design, and the higher regions by four lights placed on the tie-rods.

In the nave and choir clerestories, a shaded lamp is placed in the apex of each window arch; when these are lit and the nave and choir lights extinguished, a very impressive effect is obtained and the magnificent groining of the cathedral can be seen to advantage, as shown in fig. 2.

The triforiums are lighted by shaded lamps placed in alternate bays; 10-A plugs are fitted to the other bays to provide for temporary decorative illumination when required. The six vestibules are lighted with bowl fittings of the inverted type, and provision has been made for four outside pillar lights at the main entrances.

The vestry, session house, stairs, passages, and so on, are provided with lighting points throughout, and not the easiest part of the work was the lighting of the two spiral staircases leading by some 200 steps to the tower.

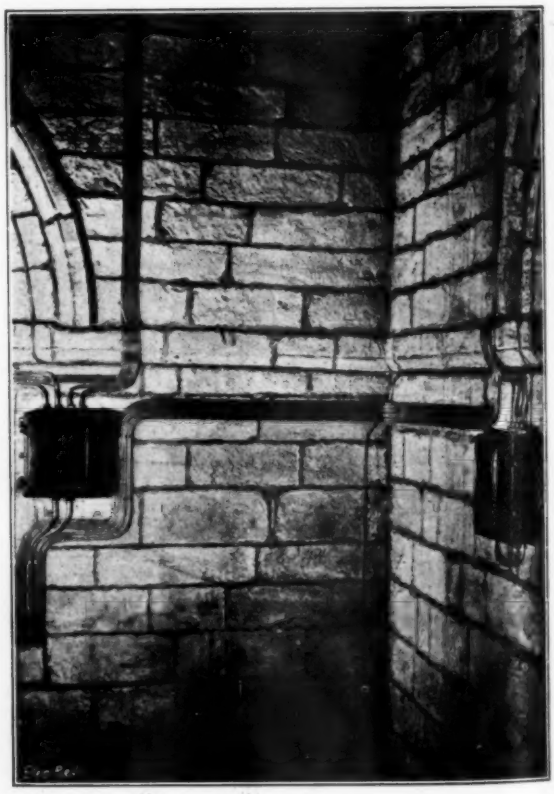

Fig. 3.—Wiring in Square Tower.

The supply is taken from the public mains at 440 V and

is split into two balanced 220-V circuits at the main switchboard. This measures 7 ft. long by 5 ft. high, and accommodates the control gear and measuring instruments mounted on siluminite panels, covered in with sliding plate-glass doors. The outside is suitably finished to match the carved oakwork of the cathedral interior.

The Stannos system of wiring was adopted on account of the salt-laden atmosphere. The wiring has been very successfully concealed practically throughout the cathedral, but where this could not be done it has been painted to match the surrounding stone work. Fig. 3 shows the wiring and sub-fuse boards in the square tower, which is the centre of the distribution. In the clerestories, where very rough walls were met with, oak slips were fixed to the walls on which to clip the wiring. The whole of the fittings were made to special designs in real bronze by Messrs Holders, Ltd., and the Edison Swan Electric Co., Ltd. The installation work was carried out by Messrs. Rendall & Wylie, local contractors, under the supervision of the consulting engineers, Messrs. J. A. Liddle & D. Miller, B.Sc., who were responsible for the preparation of the scheme, and to whom we are indebted for the foregoing notes.

Kiosk-Type Sub-Stations.

New structural designs of Messrs. Switchgear & Cowans, Ltd., eliminating the necessity for interior doors by interlocking the main doors.

HAVING benefited by the primary advantages of the kiosk sub-station, engineers are now demanding further economies for such installations, both with regard to the cost and the space occupied. In this connection it is interesting to learn of some improved models which have been recently introduced by Messrs. Switchgear & Cowans, Ltd.

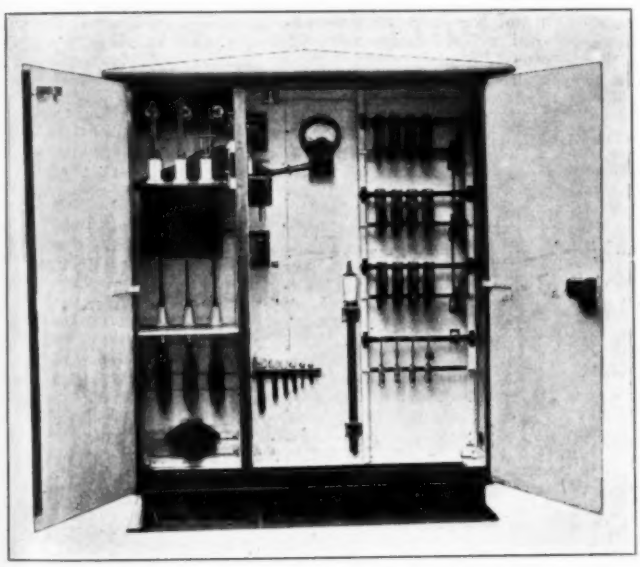

Fig. 1.—100-kVA Terminal Kiosk ; Switchgear Compartments.

Fig. 2.—Ring-Main Kiosk.

In the usual form of kiosk sub-station the h.p. and l.p. compartments are arranged on separate sides of the structure, and interior doors are fitted to the h.p. compartment as a protection against exposed live parts. In the new design by the above firm interior doors have been eliminated by interlocking the main doors, thereby considerably simplying the construction. The h.p. and l.p. compartments are situated both on one side of the kiosk, as shown in fig. 1, which illustrates a terminal feeder sub-station of 100-kVA capacity. Two half doors serve these compartments and the one giving access to the l.p. equipment is secured by a strong Yale lock. The l.p. circuits are distributed through patented unbreakable fuse carriers mounted on steel rods insulated with micanite, no china, slate, or other fragile material being used. The operating handle of the e.h.p. oil circuit breaker is accessible from the l.p. compartment. While the circuit breaker is in the "on" position the door of the compartment cannot be opened, it being interlocked with the circuit-breaker operating gear. It is also secured by a padlock arranged inside the l.p. compartment.

A steel wall separates the two classes of apparatus, and the result is a high degree of compactness with adequate accessibility, it is claimed, for the instruments, tools, operating levers, and easy operation. At the back of the switchgear a large compartment provides for the transformer equipment, occupying the full depth of the kiosk. The two doors of the transformer compartment are interlocked with the h.p.-apparatus door, so that it is impossible to gain access to the transformer until the circuit breaker is in the "off" position and all the live parts are dead. Further, the circuit breaker cannot be closed while the transformer doors are open. Rails are provided for accommodating the transformer wheels.

Similarly arranged kiosk sub-stations for ring-main systems are obtainable; fig. 2 illustrates the transformer compartment side of such a kiosk with an additional compartment accommodating the isolating switches controlling the incoming and outgoing feeder circuits. The structures are well ventilated by louvres at the bottom and a space all round under the eaves of the roof. A feature is the absence of any protruding parts from the exterior which would invite youthful climbers to get on the roof.

Fires on Electrical Installations.

In order to secure closer co-operation between the fire brigade and the electrical power station in the event of fires affecting electrical installations, the German Association of Electro-Technicians has issued instructions under which all the important distributing stations must have trained men who can be sent at the request of the fire brigade to the place where the fire occurs. On the other hand, the fire brigade must have special electricians trained by the electrical authorities to carry out electrical work. The use of electric lighting in fire fighting is advocated, as it serves its purpose in smoke-filled rooms and facilitates rescue work. Only non-conducting extinguishers, driven by non-conducting means, may be used, and in case of wooden poles catching fire, when water has to be used, the electrical conductors must be made dead before extinguishing the fire, to avoid the risk of electric shock from the stream of water. When the work is over all parts of the undertaking affected by the fire must be completely cut off before anyone is allowed to enter.

A.C. Measuring Instruments.

The more important developments in the design and construction of indicating and recording, as distinct from integrating, meters; and an account of some of the authors' investigations.

By Lieut.-Col. K. EDGCUMBE, R.E. (T.A.), Vice-President, and F. E. J. OCKENDEN, Graduate I.E.E.

(*Abstract of Paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE writing of the paper has been prompted by the large amount of valuable material produced during the last few years, but little of which has been put into such a form as to make it available to the designers of electrical measuring instruments. During the past 35 years only two papers dealing with the subject in a general way have been read before this, or any kindred, body.

The number of different sizes of meter shows a tendency to decrease, concentration being on the 6-in. or 5-in. round sizes for general industrial use, and on the 6-in. or 8-in. sizes for switchboards; for many industrial purposes, 3-in. or 2-in. round instruments are all-sufficient, and are economical in respect of both first cost and space occupied.

The general tendency in construction is to eliminate hand-work as far as possible, with the result that stampings and die-castings have largely taken the place of machined parts, thus giving a standardised product which is both cheaper and better than heretofore. It may be well to emphasise the importance of avoiding the use of aluminium, and still more the use of zinc, in their preparation. An alloy containing zinc is almost certain to prove unstable and will sooner or later give trouble, particularly in tropical climates; white-metal die-castings are absolutely stable, even under the most adverse conditions, provided that the use of the above two metals is avoided.

A similar process of evolution has been going on as regards working principles.

It seems safe to prophesy that, in the near future, industrial a.c. requirements will be met as follows:—

Quantity to be measured.	Type of meter.
Current	Moving-iron, with or without current transformers
Low voltages	Moving-iron, directly connected
Moderate voltages ...	Moving-iron, through voltage transformers
Extra-high voltages ...	Electrostatic
Power	Electro-dynamic
Radio-frequency current	Thermo-couple, or thermo-expansion (hot-wire)

A scale subtending an angle of about 120 deg. instead of 90 deg. has now become almost universal in round instruments; probably this has largely contributed to the elimination of the induction type, since the only advantage which can be claimed for the latter is its 300 deg. scale, but it is useless to increase the exactness with which a certain deflection can be read if the inherent errors of the instrument are such that the correctness of the deflection itself is in doubt. The stress in the material of a given spring is proportional to the angle turned through, so that a 300 deg. deflection involves a stress 2½ times as great as that of the 120 deg. This necessitates the use of a thinner spring, with its attendant disadvantages and difficulties of construction. Much progress has been made of late in the design of meters having scale shapes appropriate to the service for which they are intended. In B.S.S. No. 89 of 1926, it is stipulated that the suppressed portion of the scale shall not exceed one-half of the whole.

A feature which is only now beginning to receive the attention it deserves is "ruggedness." The lighter the moving parts, the better will a meter withstand rough treatment; it was at one time believed that a criterion of excellence in this respect was the ratio of the torque (τ) corresponding, with a given angular deflection, to the weight (w) of the moving parts; however, an instrument with light moving parts may have a lower "torque/weight" ratio than would be satisfactory for one with a heavier system. It is agreed, in fact, that the "pivot factor" may be expressed as τ/w^n, but authorities differ as to the value to be given to n. The pivot factor, if expressed as torque/$w^{1.5}$, should not be less than 0.0004 when τ is expressed in gramme-cm. per degree of deflection and w in grammes.

Moving-Iron Ammeters and Voltmeters.—The authors felt convinced that the moving-iron principle, if properly applied, would lead to the construction of a precision ammeter or voltmeter, as good as or better than the electro-dynamic type and suitable for use indiscriminately with a.c. and d.c.; accordingly, the possibilities were carefully explored. That the double iron affords a higher torque for a given expenditure of power than the single, the authors believe to be a fallacy. In any case, it was found that for a given torque the volt-ampere consumption could be made lower with the single iron, owing to the reduced mean length of each turn, and with a single iron of nearly circular shape, so pivoted that it could be drawn into a narrow slot in the centre of an oval coil, as shown diagrammatically in fig. 1, the relative change of self-inductance could be made larger and the product I^2L smaller than with any other form of movement, thus confirming the wisdom of the choice. The authors' coil and moving iron when tested on the Anderson bridge showed an inductance of 0.06 henry with a change of inductance of as much as 30 per cent. from zero to full deflection. The product I^2L was 1,500, the current I and the inductance L being measured in c.g.s. units. An oval coil with an overall width of 1¼ in. and a length of ¾ in. was ultimately decided upon, and by suitably shaping the iron disk and taking advantage of the distorted field given

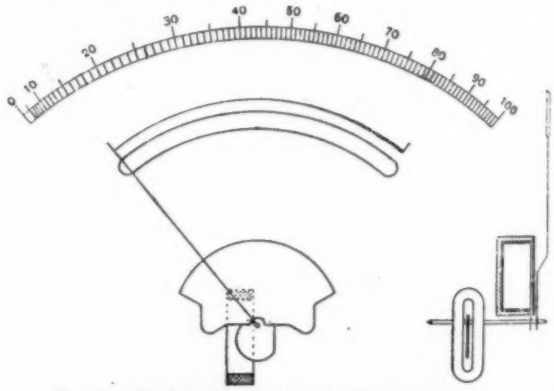

Fig. 1.—"Precision" Moving-iron Instrument and Scale.

by so short a solenoid, it was found possible to obtain a scale of the shape indicated in fig. 1, which, except for the first 10 per cent., is sensibly evenly divided, but exhibits a desirable closing up of the divisions towards the upper end.

Practice has differed greatly as regards the flux density in the iron, values ranging from 500 to 5,000 gauss being found in representative moving-iron meters. It was found that the torque could be increased by as much as 25 per cent. without increasing the weight of the iron, by "dishing up" its edges so that they presented a larger surface to the air where the magnetic lines passed from the one to the other; and it seems probable that any small increase of torque which may result from a thickening of the iron is due principally to this cause.

Moving-iron meters in which the iron was worked at a very low flux density, say, in the neighbourhood of 500 gauss, invariably gave a higher reading with a.c. than with d.c., more especially towards the upper end of the scale. Investigation showed that this was due to the shape of the B/H curve, which is reasonably straight above 1,000 gauss, but below this flattens out considerably. In fact, the permeability of the iron at a flux density of 570 gauss is about 30 per cent. greater than that at 400 gauss, as shown by the slope of the B/H curve at these flux densities. The effect will be clear if it is assumed that a d.c. of 4 amperes, flowing through an ammeter winding, magnetises the iron to 400 gauss; an a.c. of 4 amperes (r.m.s.) will have an instantaneous peak value of about 5.7 amperes, which will carry the flux up to a part of the curve in which the permeability is much greater, so that the meter will read slightly high, as compared with direct current. It is the excursion of the sinusoidal a.c. wave into regions of higher permeability which accounts for the results obtained. That it is due to the wave-form and

not to reversal is shown by the high readings obtained when the iron is magnetised by commutated a.c. These considerations indicated the disadvantages of too low a flux density, but there must also be an upper limit, since the B/H curve flattens out again at higher values of B and it is essential that the density should not be so high that a peaky wave of current would carry it over the knee of the B/H curve. The iron represents a negligibly small part of the total magnetic reluctance, and so long as the peak value of the wave does not greatly exceed 8,000 gauss, the saturation effect, and with it any wave-form error, will be inappreciable.

Taking these facts into consideration, a flux density of 2,000 gauss (r.m.s.) would represent a satisfactory figure; even should the peak value reach 10,000 gauss this could only introduce an error representing a small fraction of 4 per cent. This effect, whilst the exact converse of that previously alluded to, is likely to be less important since then it was the major portion of the wave which was in the region of reduced permeability due to low flux density, whereas now it is merely the peak of the wave which is in the region of reduced permeability due to high flux density.

In an a.c. instrument hysteresis will cause a lag of the flux in the iron behind the magnetising force producing it, and it follows that the net torque at any instant is proportional to BH cos θ, where H is the r.m.s. magnetising force, B the r.m.s. flux density in the iron, and θ the angle of lag between the magnetising force and the flux. A direct measurement of this angle was made: taking as an example a flux density corresponding to full-scale value (B=2,000), the angle of lag was 33 minutes, so that the decrease in the reading due to a.c. hysteresis would be $(1-\cos\theta)100=0.005$ per cent., a negligible amount.

That hysteresis should not cause the reading to be appreciably smaller with a.c. than with d.c. appeared to be so much at variance with the generally accepted view, that it was thought desirable to check the measured angle against the angle calculated from the known characteristics of the iron. The result showed that the conclusions arrived at in the preceding paragraph are justified. Having eliminated hysteresis as a source of appreciable error, the reason for the undoubted fact that certain moving-iron ammeters do read considerably lower on a.c. than on d.c. was ultimately found to be due almost entirely to eddy currents—a source of error which does not appear to have been sufficiently appreciated in the past, quite undue prominence having been given to hysteresis. For example, a small copper plate only 1 mm. thick placed 10 mm. from the moving iron and normal to the flux, introduced an error of 1 per cent. in the reading, and if brought up to 1 mm. the error increased to 14 per cent. These tests were made at 700 cycles per second; at 50 cycles per second the error in the latter case amounted to 1¼ per cent. These comparatively large errors are undoubtedly due to the fact that the flux in the moving iron emerges from it at a high density, forming a sort of jet of flux, a form which is, of all others, best calculated to generate eddy currents. In any case, the selection and heat treatment of the iron require the utmost care, and it is now possible to construct moving-iron instruments which, for all practical purposes, exhibit no hysteresis error whatever, even with direct current.

In the paper are set out in detail the observed characteristics of meters constructed upon the principles enunciated, and the maximum error due to any of the causes enumerated (in the paper) does not exceed 0.1 per cent. in the case of the voltmeter (0-150 V, 7.5 watts) at power frequencies, and in the case of the ammeter (0-10 A, 0.5 watt) at any frequency up to 700 cycles per second, a result which the authors believe to be unique for a moving-iron instrument, and superior to that attainable with an electro-dynamic voltmeter or ammeter of equivalent range and power consumption. A further advantage possessed by this "Precision" instrument lies in the scale shape, fig. 1.

There is no difficulty in producing for any moderate current a single-range ammeter having this degree of precision, so long as care is taken to avoid eddy currents in the mass of the conductors. The design of a multi-range ammeter presents a number of difficulties. Now that truly "precision" current transformers are available the most satisfactory arrangement, so far as a.c. measurements are concerned, is to use a multi-range current transformer. A limited change of range can be effected by winding the coil in sections, which are connected in series or in parallel, as required, but the practical limit of range is, at present, 1 to 2 or 1 to 4. The self-inductance of the ammeter considered is, however, so small as to enable the range to be increased by means of shunts without impairing the accuracy for either direct or alternating current. Possibly the reason for the past neglect of the moving-iron type is that the electro-dynamic principle lends itself so readily to theoretical and mathematical treatment, and has advantages which, however difficult to realise in practice, are sufficiently convincing when discussed in the abstract.

Measurement of Rectified Current.—Rectified a.c. is now used for many purposes, so that its measurement is a matter of some importance. It must not be assumed that a rectified current, because unidirectional, can be treated in all respects as a direct current. A permanent-magnet moving-coil ammeter will measure the d.c. component and will ignore the a.c. component; that is, it will measure the mean value of the wave. An induction-type ammeter, on the contrary, will measure the a.c. component and will largely ignore the d.c. component, whilst an electro-dynamic or moving-iron ammeter will measure the r.m.s. value of the whole wave. Strictly speaking, therefore, it depends upon the nature of the load which form of ammeter should be selected. All things considered, the moving-coil ammeter, owing to its intrinsic advantages, is to be preferred for the measurement of rectified current under normal conditions.

Electrostatic Voltmeters.—For higher voltages than 7,000 V, owing to the cost and size of voltage transformers, the electrostatic voltmeter has many advantages. Cases also frequently arise in which the current passed by the transformer-operated voltmeter puts it out of court (*e.g.*, for some leakage indicators); again, when portability is important the electrostatic voltmeter has much to recommend it. It is usually preferable that electrostatic voltmeters for alternating voltages exceeding 5,000 V should be connected in series with condensers, by which means the range can be extended as required; it is advisable that the voltage across the meter itself should not be more than, say, 3,000 volts at full deflection. If properly designed, series condensers are quite satisfactory for voltages up to, say, 30 kV, so long as one terminal of the voltmeter can be earthed. For laboratory voltmeters, where a number of series condensers of ample capacity can be used and the conditions are well under control, such voltmeters have been satisfactorily used up to 250 kV above earth, or 500 kV in all.

The direct-connected air-insulated electrostatic voltmeter is entirely free from errors due to frequency, wave-form, temperature, earthing, or otherwise, of either terminal, and so forth, and is available up to 500 kV or more. For laboratory use electrostatic voltmeters have been constructed in which air (or, still better, nitrogen) is used at a pressure of about 150 lb. per sq. in., under which conditions it has a breakdown voltage of some 200 kV per cm. In such meters the control is usually electro-dynamic so that the whole moving system can be enclosed in the high-pressure chamber, the electrostatic element being brought back to zero by varying the current through the electro-dynamic portion.

It is often necessary to determine the peak value of a voltage as well as its r.m.s. value. The simplest method of so doing is by means of the neon tube in conjunction with an Abraham or other extra-high-voltage, air-insulated, electrostatic voltmeter.

Electrostatic voltmeters are liable to damage through overvoltages due to surges, and a fuse alone is unreliable as a means of protection; such meters should be protected by a resistance in series with each pole. The capacity current taken by the voltmeter at power frequencies is so small (of the order of 30 micro-amperes for all ranges at 50 cycles) that a resistance of several megohms will not appreciably affect the reading, so long as the instrument is correctly designed. Protective resistances usually take the form of rods of carbon having an admixture of some substance which increases their specific resistance. It is important that the protective resistance should not be such that its resistance decreases greatly with high voltages or rising temperature, as is sometimes the case.

Thermo-Expansion Instruments.—It is usually assumed that thermal meters, whether of the thermo-expansion (hot-wire) or thermo-couple type, are equally accurate with d.c. and a.c. at any frequency, but such a statement cannot be accepted without considerable qualification where radio-frequency currents are concerned. So long as a single heater is employed, error is limited to that introduced by the increase of resistance due to the Kelvin skin effect, and for small conductors this is usually inappreciable. For example, a single wire suitable for carrying 3 amperes at full scale can be used up to a frequency of 5,000,000 cycles per second without the error due to this cause exceeding 1 per cent. For currents greater than 5 amperes the hot wire becomes so large as to introduce thermal sluggishness, and it is usual to employ two wires in parallel, only one being coupled to the pointer. To measure currents greater than can be carried by two reasonably small wires, it has been customary to arrange a number of such wires or strips round the circumference of a cylinder (squirrel-cage), only one of them being coupled to the pointer. So long as the conductors leading the current into and out of these wires are exactly coaxial with them, the current distribution will be uniform at radio frequencies, and if the ohmic resistances of all the wires are identical the indications will be independent of frequency; these two conditions are, however, extremely difficult to fulfil. A method of securing the necessary even distribution of current at radio frequencies which has not, so far as the authors are aware, been employed, is to arrange the leading-in conductors concentrically, the inner one passing down the axis of the squirrel cage. Even then, the difficulty of ensuring equality of ohmic resistance between the different wires still remains, not to mention constructional complications. The "shuntless" hot-wire ammeter in which a single active wire is divided up into three or five parallel sections, the current being led to and from it by means of flexible ligaments attached to the wire at the appropriate points, has proved fairly successful at power frequencies, but when applied to radio-frequency measurements the difficulty of making the several parallel paths sufficiently symmetrical is enormous.

In general, where radio frequencies are concerned a current of 6 amperes is as high as it is possible to measure direct with any degree of accuracy. Above this, the use of a radio-frequency current transformer is greatly to be preferred. They are now available for any current up to 1,000 amperes, or

more, and give equally accurate readings on all ranges. Moreover, the power consumption is small and they can be fixed in positions in which it would be impossible to install an indicating instrument.

Graphic Meters.—The moving-coil type has been found the best for d.c., whilst for a.c. the ironclad electro-dynamic system is to be preferred. Considerable improvements have been made of late years in the inking arrangements, and pen friction may be eliminated either by allowing the pen point to swing clear of the chart, on to which it is pressed at intervals so as to leave a record of its position, or by causing the electrical movement to operate the pen indirectly, through some form of relay. The "thread recorder" has been considerably used for temperature measurements, but is unsuitable for dealing with rapidly varying quantities such as are met with in most electrical work. The "relay" arrangement for a great many purposes probably represents the most satisfactory form. The latest is that due to Mr. E. I. Everett, and is available for the measurement of comparatively rapidly varying quantities and is, moreover, a deflectional instrument.

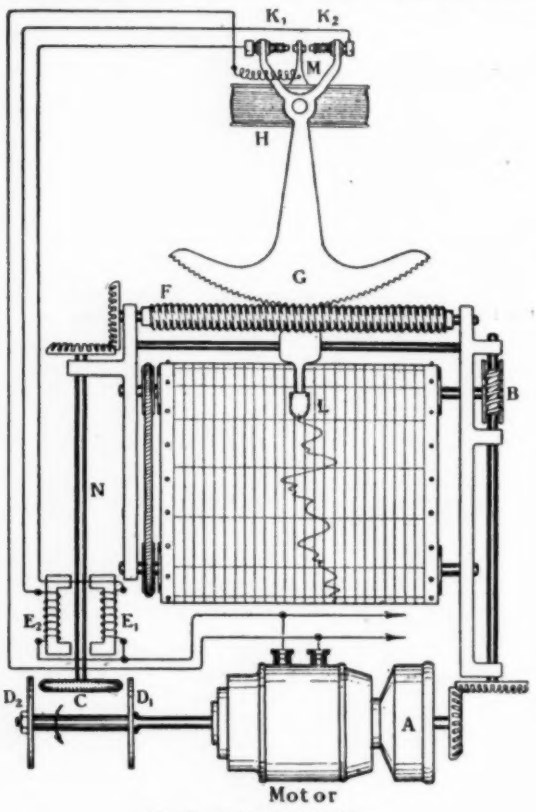

Fig. 2.—Relay Graphic Meter.

The working principle will be clear from fig. 2: H represents the controlling electrical movement which carries a contact arm M; should this arm deflect to the left, for example, it will make contact with K_1, and so cause a current to flow through E_1, which attracts the rod N, thus pressing the leather-rimmed wheel C into contact with the motor-driven disk D_1. The wheel C is thereby driven in a clockwise direction and causes F to rotate in such a sense as to carry the pen (L) towards the right. At the same time G is moved towards the right, thus tending to cause the contacts M and K_1 to part; this will actually occur when the coil H has reached its point of equilibrium, and at once E_1 ceases to keep C in contact with D_1, so that the travel of the pen stops until M once more makes contact with either K_1 or K_2, as the case may be. The motor carries an adjustable centrifugal governor (A) and serves also to drive the chart by means of the vertical spindle and worm B. The governed-motor principle is equally applicable to alternating-current or direct-current systems, but for the former the Warren synchronous motor is to be preferred.

(To be concluded.)

Discussion in London.

Dr. C. V. DRYSDALE congratulated the I.E.E. on having accepted such a paper, saying he found himself in substantial agreement with its contents from end to end. He had no serious fault to find with anything in it, and was glad that the authors had put some of his own ideas into practice. He agreed with the authors' list of types of instruments which would survive: the hot-wire expansion instrument would not, for the thermo-junction pattern was the better; the dynamometer voltmeter would endure for testing purposes, but the induction indicating types had seen their day. The new nickel-iron element would create a revolution in all electromagnetic instruments and make possible the use of iron where it had formerly been impossible; moreover, for shielding purposes to reduce the internal field it would be very useful indeed, and he hoped it would be universally employed; its possible applications were many. He congratulated the authors on having obtained a very long instrument scale, and was glad to know they appreciated the electromagnetic efficiency of instruments, although the inductance method of looking at the subject was useful for designing the right type of scale. Having to do a great deal of testing, he was, naturally, favourably inclined towards an instrument which would measure equally well both a.c. and d.c. He had been considering for a long time how such a meter could be made, for it would be an extremely useful device: by means of specially formed copper-strip coils (the arrangement of which the speaker demonstrated with the aid of models and lantern slides) which could be connected in series-parallel as required by a cam shaft, avoiding soldered joints altogether, it was possible to devise an instrument that would serve the purpose.

Mr. F. H. NALDER thought the authors had crystallised many of the ideas which had been before instrument makers for some time. He did not agree that long-range instruments were going to die just yet awhile, neither was he in agreement with the authors' contentions about springs: they all had to make suppressed scales. The slightest deformation of a coil would be disastrous in the case of a narrow scale. The paper would afford much food for thought in the future.

Prof. G. MACGREGOR MORRIS was of the opinion that the paper could have been divided into three parts and each discussed on a separate night, as there was so much in it. With regard to the driving of the chart of a graphic meter by means of a motor, if the supply of electricity failed the motor would stop, and it seemed therefore that something was needed to tide over such an occurrence. He agreed with the authors' list of meters that would survive; a number of workers were at present engaged upon the investigation of the neon tube electrostatic voltmeter, and he was confident that that type of instrument would be greatly developed, but not many people would care to put their heads near the telephone indicated in the authors' illustration. Dr. Drysdale had anticipated him on several points; he supported him and put in a plea for the logarithmic scale: that was what was wanted in the laboratory, but it was difficult to convince makers and their customers, too, that it was the desirable scale. It was a very great achievement of the authors to have reduced the error of instruments that would measure both a.c. and d.c. to "nil" (*i.e.*, well under 0.1 per cent.). Had the authors had any difficulty in obtaining the proper types of materials for making the disks of moving-iron instruments? He asked that question because certain experiments had indicated that the flux was jerky; it did not move into the iron uniformly, which phenomenon was perhaps due to the grain of the iron.

Mr. A. F. HARRIS did not favour the use of series condensers for extending the range of electrostatic voltmeters, and he thought the latter could be made smaller than was indicated in the paper.

Mr. S. T. SHORT was happy to hear that the hot-wire instrument was dying, and the sooner the better. There could be little doubt about the accuracy of the authors' list of types that would survive, but he was sorry to see that the 120-deg. scale was superseding the other; was there some definite angle which, if exceeded, would introduce a definite error? He would like the authors' experiments with moving-iron instruments extended and the disk shaped into the form of a cup, which might be an improvement. It was difficult to appreciate some of the remarks in the paper with regard to the use of shunts in conjunction with moving-iron instruments.

Mr. R. W. PAUL pointed out that nothing had been said about damping, which might be more serious to contend with than eddy currents. He was not hopeful about the use of condenser multipliers for electrostatic voltmeters. Instrument makers would like to know more about methods of construction and the general internal arrangement of the instruments.

Mr. C. L. LIPMAN thought the paper would be helpful to designers, but when its various sub-head sections were considered it appeared to be behind the times in several respects. He referred to the space economy that resulted from the adoption of rectangular instruments, and also to the several advantages of a new type of induction ammeter of high accuracy, quoting figures, but was unable to detail constructional features at the moment; its description would be published, however, as soon as possible. His opinion was that the 300-deg. scale had several advantages and was superior to any others. In the making of satisfactory transformers the metallurgist played an important part.

Mr. W. PHILLIPS alluded to the importance of the new metal, and stated that with the disk pattern of moving-iron instruments he had obtained results similar to those outlined in the paper. In the case of current transformers, he could fully endorse all the authors had said. The great advantage of the new metal was the fact that the curves were so flat; there was not much variation in the error from zero to full scale. When making shields the exercise of great care was necessary, as it was possible for an instrument to be worse with a bad shield than without it; the new metal was extremely susceptible to heat treatment, and it must be treated after having been mechanically handled.

Dr. W. H. ECCLES, the president, remarked that the scarcity of papers on the subject before them seemed to be the result

of national neglect of the subject: they had been too busy with other things, which was the more surprising when they considered the great changes that had come about in the quantities to be measured. Recent new instruments were merely variations or combinations of ideas that had been known for 50 years or more; the only really new thing physically was thermionic emission controlled by the third electrode of the valve. With that and the new metal which had been referred to they could look forward.

Lieut.-Col. K. EDGCUMBE, in reply, said that the main bone of contention appeared to be the induction type of instrument; if they wanted a "Big Ben," to be seen anywhere in the engine room, let them use that pattern by all means, but his idea was that the moving-iron type was the better; to-day the control engineer never entered the engine room. The results claimed by Mr. Lipman could, no doubt, be obtained, but what about the weight ratio? Were such instruments really wanted? "We will wait and see."

Mr. F. E. J. OCKENDEN also spoke briefly in reply to some of the points raised, remarking that damping did introduce difficulties, but if the moving system was kept away from the box sufficiently they could be guarded against.

Electrical Installations in Mines.

Precautions that minimise the risk of "open sparking"; and the use of discriminative protection devices.

By J. A. B. HORSLEY, H.M. Electrical Inspector of Mines.

(Abstract of a Paper read before the MANCHESTER GEOLOGICAL AND MINING SOCIETY.)

THERE is no essential difference in the precautions that must be taken on either h.p. or l.p. electrical mining systems if the risk of "open sparking" is to be minimised, and these precautions may be considered under two headings, design and maintenance. The former covers not only the suitability of the apparatus, but also the lay-out of the installation, including the selection and application of the automatic and other devices which are provided to control the system. The British Engineering Standards Association has recently defined flameproof enclosure for electrical apparatus, and has prescribed the tests which should be applied to prove compliance with that definition. The specification will soon be published as B.S.S. No. 229, and it should be studied by those who are concerned with this problem. It makes it perfectly clear that the flameproof quality of the enclosure is limited to conditions of operation within the rating of the apparatus, including recognised overloads.

It would not be commercially practicable to construct apparatus that would resist the destructive effect of an internal short-circuit when the source of energy was relatively very large and when there was but little impedance in the intervening circuit to limit the violence of the fault. Complete automatic protection is not possible without a high standard of maintenance of insulation. To avoid inconvenient interruptions of service, there is a temptation to tamper with the automatic protective devices, and such interference appears to be regarded as a laudable exercise of ingenuity. A working approximation to absolute continuity can be realised by duplicating important feeder cables and items of plant and by subdividing and applying automatic protection to the cable branches in such a way as to limit the interruption, on the occurrence of a fault, to the defective branch. Maintenance of insulation resolves itself into the application of tests to discover incipient faults before a breakdown occurs, either in the cables or apparatus. The ordinary indicating instrument, unless it is under continuous observation, is of little practical value, but the leakage indicator might be useful to this end.

It is not as generally known as it might be that leakage indicators can be applied effectively to earthed systems, excepting only the earthed concentric system in which it is not possible to distinguish between currents due to leakage and those that are normal to the system. A method of leakage indication used by some electric power companies for small transformer sub-stations consists in earthing the neutral point of the secondary winding of the transformer through a small fuse which is shunted by a suitable number of ordinary incandescent lamps connected in series. If an earth fault occurs on the consumers' circuits, the small fuse is blown and the lamps are lighted so long as the fault continues.

This is a very cheap way of obtaining fault indication, but the blowing of the small fuse removes the low-resistance path to earth just at the moment when it is most urgently required to ensure the operation of the automatic protective devices upon the consumers' installation. Such a method may be good enough for small surface installations, but reliable and complete automatic protection is so important for a colliery installation below ground that it should never be accepted for a mine system. The information obtained by the use of a leakage indicator must be supplemented by actual insulation tests of parts of the circuit, and if such tests were made systematically at sufficiently short intervals of time it should be possible to locate and remedy defects before they developed into serious faults; a graphic recorder should be of value in exercising control of this work. Assuming that the apparatus to be protected is capable of withstanding the mechanical stresses arising from the magnetic forces due to abnormal current, and ignoring the destructive effects of the electric arc when there has been a complete failure of insulation, there remains the question of limiting the temperature that the conductors may attain to a value which will not entail permanent injury. This temperature is a function not only of the current, but of the time. Fuses to some extent possess this time-temperature characteristic, and if they were not so much at the mercy of their environment would appear to offer a simple means for limiting the current flowing in the normal path to a predetermined value.

In practice fuses can only be used to cater for short-circuits, and cannot be applied generally so as to prevent a cable or a motor from becoming overheated due to a sustained overload. A ventilated motor built to comply with B.S.S. No. 168-1923, and having a continuous rating, must be capable of being worked at 25 per cent. overload for a period of from 30 to 120 min., 50 per cent. for 1 min., and 100 per cent. for 15 seconds, in all cases without injury to the motor. It will be obvious that no ordinary fuse could prevent an extension of the period of the sustained overload first referred to or distinguish between the permissible and dangerous duration of the short-period overloads. This criticism of the fuse is with reference to mining practice. The author is aware of attempts that are being made with more or less success to produce fuses that may properly be described as instruments of precision, and those who are interested should refer to a paper, entitled "High Power Fusible Cut-outs," by L. C. Grant, published in the *Journal* of the Institution of Electrical Engineers for September, 1926 (Vol. 64, No. 357) [ELECTRICAL REVIEW, April 2nd, 1926, p. 558.]

The ordinary circuit breaker equipped with an overload trip device can be set with greater precision and certainty than can be hoped for with the fuse, but otherwise it shares the limitations of the latter. To allow for starting rushes of current and for overloads which are quite innocuous if not sustained or repeated at too brief intervals, it is necessary to set up the trip of the circuit-breaker so that it shall not trip at less than, say, three times the normal full-load current of the motor that it protects. If a standard continuously rated motor is to be adequately protected against overheating due to a sustained overload, the protective device should operate when the sustained load exceeds the normal full load by more than 25 per cent. These antagonistic requirements can be met quite simply by adding a device, such as an oil-immersed dash pot, which will retard the action of the trip. The delay may either be definite or it may have an inverse time characteristic, which means that the greater the overload the less will be the delay introduced by the device.

For the control of individual motors the variable type of time lag is more suitable, while for protecting a cable system when there are two or more circuit-breakers in series the fixed type of time lag may be used if it is desirable to make the overload protection selective.

A well-known switchgear firm has recently introduced an ingenious adaptation of its standard time lag to meet the case

where the starting torque is abnormally great in proportion to the running torque. This consists in the addition of a "pilot" dash pot, controlling a by-pass valve in such a way that the normal lag is increased for a sufficient length of time to allow the motor to run up to speed. The by-pass then opens and the time lag functions normally.

With "overload" protection alone it is difficult to limit the interruption of service to the branch circuit upon which the overload has occurred if there are several circuit-opening devices in series. It is not always realised that the current which may flow momentarily to a fault through a fuse or a circuit-breaker equipped with an overload trip is not determined by the size of the fuse or the setting of the trip, but by the size and type of the supply plant and the resistance or impedance of the intervening cables and apparatus. There can be no certainty, therefore, that a fault which causes the opening of an overload protective device near the boundary of the electrical system will not simultaneously operate similar protective devices near the source, although the setting of the latter may be 10 times that of the former.

It must also be recognised that the fault current may be limited by the impedance of the circuit to a value below that at which the circuit-breaker is set to operate, but may yet result in local overheating sufficient to originate a fire.

The remedy lies in the use of leakage protection, and if this is applied so as to be selective in action, not only is the interruption limited to the faulty sub-circuit, but in most instances the fault is isolated in its initial stages, *i.e.*, as a single-pole or single-phase fault to earth, before it has developed into a short-circuit between the poles or phases.

Leakage protection, if it is applied so as to interrupt the supply to the whole installation on the occurrence of a fault at any point, is of no practical value. Complete selectivity can be secured upon a.c. systems by the use of pilot wires which are employed to balance the voltage or current at the two ends of the circuit. Even without pilot wires it is possible to secure selective leakage protection for overhead lines, or for two or more cables working in parallel, by the arrangement known as split-conductor protection. The method is easily applied to overhead lines, and it ensures that if one of the wires composing a split should break and fall, the circuit-breaker would be instantly tripped.

The three essential conditions to the safety of apparatus in mines are as follows:—The apparatus must be safe for use within the limits of its rating, in the presence of an explosive mixture of firedamp and air; "the (automatic) protection of the circuit must be such as to ensure, as far as practicable, that the highest recognised overloads for the apparatus shall not be exceeded, having regard to the amount of destructive energy available at the apparatus, calculated from the size of the generating plant and the impedance of the circuit between it and the apparatus" (B.S.S.); the standards of maintenance and discipline must be such as to ensure, in general, that the electrical equipment involved shall be kept as nearly as possible in perfect condition and, in particular, that there shall be no improper or ignorant interference with the essential parts of any flameproof enclosure, nor with the adjustment of the automatic protective devices that are associated therewith.

The third condition is perhaps the most difficult of fulfilment, but it would be nothing less than criminal folly to install and use electricity in a place where firedamp is likely to occur in a dangerous quantity unless those responsible for its introduction were prepared not only to procure the most suitable equipment, but to so organise the supervision of the plant as to ensure, as far as possible, that it should be maintained in its original integrity

Institution of Electrical Engineers.

The Annual Dinner of the Mersey and North Wales (Liverpool) Centre.

ABOUT 80 members and guests were seated at the annual dinner of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers, which was held in Liverpool on February 2nd, when Mr. P. J. Robinson, chairman of the Section, presided, and some interesting speeches and an excellent musical programme resulted in an enjoyable evening for all present. The usual loyal toast was given, after which "The City of Liverpool" was proposed by Col. J. F. LISTER, C.M.G., chairman of the South Midland Centre. He said that Liverpool had one of the oldest electric railways in the country, and that the North Country was ahead of other parts in that connection. Great credit was due to the Liverpool electricity undertaking for its low supply charges. The city had nothing much to gain by the new Electricity (Supply) Act. He agreed that the "grid" would be useful within reasonable areas, but not if taken to such parts as North Wales. In Egypt some years ago he saw knife and scissor grinders using electricity to drive their grindstones, which showed that the people were anxious to take an electricity supply if they could get it cheaply.

In reply, the Rt. Hon. the Lord Mayor of Liverpool, Councillor F. C. BOWRING, pointed out that Liverpool was responsible for one-third of the import and export business of the country. Corporations were becoming great trading concerns, and the electricity supply departments were by no means the least important. He paid a tribute to Mr. Frank C. Wilson, J.P., chairman of the Liverpool Tramways and Electric Power and Lighting Committee, and regretted the absence of Mr. H. Dickinson, chief engineer of the electricity undertaking, who was ill. He understood that the much-criticised 25,000-kW set at the Lister Drive station was doing remarkably well.

"The Institution of Electrical Engineers" was proposed by Mr. TOM WHITE, chairman of the Liverpool Housing Committee, who outlined his conception of the objects of the electrical industry, received during a year of office when deputising for Mr. Wilson. If this country mobilised a great army to release us from the thraldom of trade depression, then the general staff should consist of electrical men. In the drawing up of the Electricity Act more opportunity should have been given for electrical men to exercise their abilities. He could not think that the results of the proposed unification of frequency would warrant an expenditure of £10,000,000. He had recently converted his private house to "all-electric," and had received a shock in finding that his quarterly consumption was 4,000 kWh, but he did not grudge the increased expenditure, for he had proved he was getting it back in increased health and comfort. He had induced Liverpool to build 250 all-electric houses, and he was depending on the electrical engineers to bring down the bills. In referring to the waste of sunshine due to the uneconomic methods of burning fuel, he said that the sooner we had collaboration between the medical and electrical professions, the sooner we should have an A1 nation. He had seen the great electrical manufacturing works at Newcastle, Birmingham, Manchester, and Rugby, and they seemed to him as sentinels waiting to defeat trade depression. Eighteen thousand persons had visited the electrical exhibition house at Liverpool in one week. It was an enterprise granted to the City by builders and contractors without a cost of one penny to the community. He was sure that what Liverpool had accomplished electrically could be achieved all over the country by the co-operation of the I.E.E. In 1913 the number of consumers in Liverpool was 10,000; in 1926 the figure was 41,000. Forty-eight million kWh were sold in 1913, and 172 million in 1926. To-day their plant capacity was 103,000 kW, and another 25,000-kW set would be installed next year. Liverpool now headed the list of the great towns of this country as regarded the percentage increase in the consumption of electrical energy.

Dr. W. H. ECCLES, president I.E.E., responded. He reminded Councillor White that he could have added to the laurels of his city by pointing out that Liverpool was the birthplace of wireless telegraphy. Forty years ago Sir Oliver Lodge was working in the Liverpool University on an experimental apparatus which he evolved for transmitting and receiving electrical waves over a distance of two yards. In 1897 Lodge developed a scheme of connections which foreshadowed the progress of the next 14 years. To-day an amateur with apparatus costing only a few pounds could speak to remote parts of the earth. He agreed that Liverpool was not likely to benefit much by the Act, but thought the less said on the matter the better. Perhaps the people would lose a little in patriotically helping the rest of the community. Londoners paid four times as much for their electricity, and said "come on the grid." He was glad to see that power lines were beginning to appear on the landscape in the Liverpool district. The beauty of the Swiss mountains was apparently not discovered until the power lines appeared; it was a matter of psychology. The electrical profession must try and work out that there was beauty in power lines. It was recorded that last year this country exported electrical material to a greater extent than any other country. Britain might well be described as the electrical workshop of the world. The rapid growth of the membership of the Institution was a sign of the electrical expansion in this country.

In proposing "Our Guests" Mr. E. M. HOLLINGSWORTH warmly welcomed the visitors, and the toast was responded to by Councillor Frank Wilson and Mr. H. Wade Deacon, Pro-Chancellor and President of the Council of the University of Liverpool. Mr. WILSON did not think we advertised our wares sufficiently. The average price per unit of electricity used in his house last quarter worked out at 0.728d. He paid a tribute to Mr. Robinson. In a humorous speech, Mr. WADE DEACON expressed great admiration for the vigour of the Institution.

Mr. A. E. MALPAS proposed "The Chairman," and described Mr. Robinson as one of the liver birds of Liverpool.

In reply, the CHAIRMAN referred to the great help he had received from Mr. Oscar C. Waygood, hon. secretary of the Centre.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Electric Flood-lighting.

I notice your review on this subject in the current issue of your paper, and as I have perused the contribution in question presented before the Illuminating Engineering Society at the Lighting Service Bureau recently, perhaps a few comments may be added, by one who has had an extensive practice in the use of the parabola for a period of forty years, and probably knows something of the optical characteristics which define its legitimate and successful application.

The paper referred to principally deals with the illumination of plane surfaces by means of concave reflectors with circular apertures, of parabolic or allied construction, for projecting round beams of light for use on high distance ratios.

The optical characteristics totally prohibit successful application to efficient illumination in broad and even effects over plane surfaces, whether with or without asymmetrical distribution, and the paper consists of the compilation of figures which support this view, indicating quite clearly the defective results to be obtained where such apparatus is used for lighting extensive surfaces such as building frontages, large posters, &c.

An arbitrary figure of 3 ft. 6 in. is given as the minimum projection of the lamp from the surface, but the depth of the surface is not given for such projection. The maximum projection allowed by the L.C.C. is 4 ft. from building line to light source for any depth of surface for lighting frontages. It is well known that such limited projections involve the practice of high distance ratios, and a surface of 40 ft. deep on the L.C.C. limitation would have a distance ratio of 10 to 1, while if the surface was 50 ft. deep the distance ratio would be 12.5 to 1.

Neither round projected beams of light nor asymmetrical projection can be used to give satisfactory results on such practice, and that is why wherever these are found in use the illumination is a failure from the point of view of uniformity.

In theory the apparatus recommended in the paper is totally unsuitable for the purpose, while the results give the impression that the professional is relying upon the immature conception of the amateur.

The lighting of building frontages requires the practice of the very highest art in illumination, and optical knowledge beyond that of projecting distorted beams of light, if the architect is not to have his creation spoiled by artificial lighting. What may please the novice will not satisfy the artistic tastes of the architect, who is interested in good illumination. Good results are what he requires, not light and shade.

Hall's System of Controlled Illumination.
JOHN I. HALL.

Kingston-on-Thames, *February 5th*, 1927.

Power Supply for Wireless Receivers.

I am very sorry that I appear to have annoyed Mr. Turner with my previous letter; it may possibly have been my incautious reference to a certain loud-speaker, or some other matter, but I trust that he will suffer me to point out an inaccuracy in one of his statements.

I did not state that it was entirely my own opinion that the receivers in question were distortionless, but that I was also relying on the opinion of others who were certainly quite competent to judge—competent, that is, if Mr. Turner will admit that the ear of an eminent musician is competent to judge. If we agree that no human ear can be relied upon to decide whether a broadcast receiver is distortionless or not, what is the use of striving after perfect reproduction? Should we not rather try to attain pleasing reproduction?

In reply to Mr. Turner's question—on what tests or facts I based my opinion—I can only point to satisfied users of the receivers in question, who had hitherto rejected all others offered them on the score of quality of reproduction. The opinion recently passed by a Mus. Bac., F.R.C.O., was: "What perfect reproduction!" I put it to Mr. Turner that this is a competent ear within the meaning of my letter, and could safely be used as a standard by anyone purchasing a broadcast receiver.

I am, however, going to amend the statement contained in my first letter, in the hope that I shall get Mr. Turner to answer my main question regarding low-frequency transformers and h.p. consumption, and say that I am getting pleasing reproduction with these receivers, pleasing to myself and to certain professional musicians, of no mean standing, and that I am getting it by means of *three* transformers in the low-frequency amplifier and a maximum h.p. consumption of 8 mA. There is no doubt that Mr. Turner knows quite well to which receivers I am referring, and my only object in writing my first letter was to point out that at least one other firm of vast experience in telephone and radio research work does not apparently agree with Mr. Turner that it is necessary to eliminate the low-frequency transformer in order to obtain good reproduction over the audio frequency range.

I am not in the least interested in museum specimens, my idea being that ordinary broadcast receivers were being discussed, and I should be very glad if Mr. Turner would answer my question as to how it is that I can get "distortionless" (his own word, not qualified in any way in his letter in your issue of January 7th, although he now states that there is probably no such thing as an absolutely distortionless receiver) reproduction with four valves and an expenditure of 8 mA. only, when he has laid down the law that it is impossible, and also that according to him I am merely piling one form of distortion on another.

Leaving all question of competent ears, &c., out of the discussion, my contention is that I can get "distortionless" reproduction with an expenditure of 0.75 watt d.c. supply to the anodes certainly equal, and probably superior, to that obtained by other receivers with 3 to 4 watts d.c. supply.

February 5th, 1927. **Interested.**

[This letter has been shortened.—EDS. ELEC. REV.]

Perhaps this discussion could be rendered less diffuse, and valuable space saved, by more use of definite figures.

The 2-valve loud-speaker sets mentioned by me use 9 milliamperes in the h.p. supply. Taking dry cells first, it has been found that a battery of one of the three leading makes, of 100 or 108 volts, is down to 75 or 80 in one month, and 50 in three months, on the average. The battery costs a little over £1. Now, at the end of three months what is the user to do? He has had an *average* voltage of probably 70 to 80, insufficient for proper loud speaking (100 is low, in fact), and must now replace, and pay £4 to £5 a year for an average of 70 to 80; or buy a 60-volt to put in series with the 50, and put up with the increased internal resistance of the 50 as well. The accumulator, with a first cost of £3 15s. (or less) runs at least two months, and then costs, say, 2s. 6d. for re-charge, or 15s. a year—to which must be added capital charges—and gives practically 100 volts all the time. Capital charges do not bring it anywhere near the £4 to £5 a year for less voltage.

Nothing in this world is perfect, and mention of certain precautions in my former letter should not be taken to imply that I do not consider the drawbacks of the dry battery to be very much greater. At all events, the above figures represent my own experience with 2-valve loud-speaking sets.

As to 3-valve sets, on my own, with one valve reflexed, I get commonly on loud notes a peak amplitude on the grid of the last valve of 18 to 20 volts (swing 36 to 40), and occasionally, as an extreme, 23. This has been measured carefully and repeatedly by the slide-back and another method. That is on 2ZY at 45 miles. This really overloads a DE5A with 150 volts as third valve, but even at that the current is 20 milliamperes. Add 9 to these 20; and I shall be glad to hear of an economical dry battery for this service.

A. O. Griffiths.

Caergwrle, *February 5th*, 1927.

Extra-High-Pressure Transmission.

The article by Mr. Scott in your issue of January 28th certainly raises points of interest. A super pessimist has some use in a community. He makes our flesh creep and does no real harm—so long as he is not taken too seriously.

There are two kinds of reliability—the one implying a freedom from all breakdown, and the other a practical freedom. Neither underground nor overhead transmission can give the former. If absolute reliability is desired it can only be obtained by a duplicated system—whether overhead or underground—supplied from two different sources quite unconnected, and not interconnected as he suggests. The consumer is provided with change-over switches. Such a system is available in some parts of London and is made use of by certain theatres. Outside such conditions, rarely obtainable, we have to imagine that the power station does not fail, and that it is a question of the relative reliability of overhead and underground transmission. Thank heaven it is not a question of a 90 per cent. supply, but of 99.9 per cent., even with a single overhead line, which we aim at. This means one-third of a day a year, during which the consumers' fuses are "dead."

It is not clear why the overhead line is considered by the author to be inferior in reliability to the underground. A duplicate overhead line can be obtained at the cost of a single underground line! With a single underground line one has a probability of a three days' or even a week's failure, due to a single fault, whereas with overhead work we cannot contemplate any one failure lasting more than 12 hours (*i.e.*, the hours of darkness, when it is difficult to do pole work). With a duplicate overhead line the time of failure would not exceed that with a duplicate underground line, and the capital cost would be approximately one-third to one-half. We must add to this disadvantage of the underground main the uncertainty as to the life of underground cable at 33,000 volts and over, and the certainty that a replacement means a cost equal to the original capital outlay, which would ruin any ordinary undertaking concerned in a considerable length of e.h.p. cable.

On the other hand, the whole of the insulators on an overhead line can be changed, if necessary, at about £3 to £5 a pole in a short time, and one has a complete new system of insulators at about £70 per mile. Can it be wondered that those who have to make the choice "plump" for the duplicate overhead line, which may pay its way and is as safe as the duplicate underground line which will rarely, if ever, pay where load centres are a fair distance apart?

I am not so sure that even in time of war the overhead line is in the end more vulnerable than the underground, when time of failure is taken into account. I heard of only one case in England of aircraft injuring a public supply during the war. A bomb blew a piece clean out of an underground cable at Hertford in 1915. If this had been a 33,000-volt cable it would have been a three days' job to rejoint it. If it had been an overhead line the supply would have been on again in a few hours, even if a pole had been struck.

Mr. Scott confuses the frequency of failure with the seriousness of the stoppage. One can have a dozen failures of overhead insulation with less inconvenience to the public than that due to one e.h.p. underground fault. I have just arranged to run 3½ miles of overhead country line to obviate the serious loss of credit which a cable fault will cause on a certain length of underground cable, if one should occur. We cannot face the three days' stoppage which might result.

For the rest, Mr. Scott's elementary schooling of those who are in a position to design 33,000-volt lines, is rather amusing. Imagine an engineer who sends out a window-cleaning gang each week or so to clean the insulators! Why not send someone to change the insulators for a more suitable quality in those localities subject to bad conditions?

Mr. Scott quotes the Post Office policy. Does he *know* that they in general put their trunk lines underground? If they would do so it would be a great relief to us.

W. Fennell.

Northwich, *February 1st*, 1927.

Purchase of Coal to Specification.

The statement in the second paragraph of your leader of January 21st, to the effect that "the importance of buying coal to specification is not fully realised by electrical engineers," seems to me to be of a somewhat sweeping nature, and savours of hasty conjecture rather than considered judgment.

The true situation to-day, and particularly since the war, is quite the reverse. Engineers, as a body, fully appreciate the importance of the subject, but so also do the coal suppliers, who, unfortunately, refuse, most emphatically in certain areas, to enter into any contract based upon calorific value. I have intimate knowledge of several large electricity supply undertakings scattered throughout this country which have made pioneer endeavours to purchase coal on this basis, without, however, any success at all worthy of the vast amount of care and thought required to draft a specification in terms attractive to the suppliers. The matter has been raised from time to time, not only in the technical Press, wherein, especially in the United States, splendid schemes (from the purchaser's point of view!) have been propounded, but also before the I.M.E.A., and the I.E.E., and each time the obstacle has been the suppliers' reluctance.

On the other hand, in all fairness, the reasons for this reluctance are fully appreciated by those who have had anything to do with the purchase of large quantities of coal. At the same time, however, the inherent difficulties of the situation do not, as you state, "compel purchasers to burn anything that will burn, regardless of its calorific value." Coal can always, even during strikes, be obtained from somewhere at a price, however high, in proportion to its size and quality (the latter factor being judged by experienced purchasers by other considerations than a futile analysis of a tiny sample, whose very source and method of choice are even frequently doubtful), and consequently the policy quoted would be one of false economy.

With the context of your references, however, I am in entire accord, and I should like to see the problem tackled, as it will have to be sooner or later, not in a one-sided manner as hitherto, but jointly by the suppliers and the purchasers. Even then the results will still be nil, until the purchasers realise the futility of trying to enforce a contract, with a penalty clause (and perhaps also a bonus clause, if the suppliers are good boys!) based entirely and solely upon such an unstable and utterly uncontrollable factor as calorific value.

The subject of coal is one about which it can truly be said that the more one knows about it the more one realises how little one actually does know.

Maxwell.

January 31st, 1927.

Employment for Unemployed Power Station Engineers.

Being a regular reader of the ELECTRICAL REVIEW, and being unemployed, without the dole, I first open the middle page of this journal, *viz.*, "Situations Vacant," and I get busy and spend hours writing out applications for any vacant situation. I should like to say that I, like many more out of work, have had considerable experience, and it is really heart-breaking writing week in and week out without results.

I also look at the Personal Column of the ELECTRICAL REVIEW, where it is most interesting to learn of the promotions, &c., of certain engineers. I notice many times in the Personal Column that charge engineers of one station have been appointed as charge engineers at another station. Good luck to them if they require a change, but I am sure my brother engineers who are still out of work, will agree with me that if these jobs were filled by unemployed engineers first, it would shorten the list of unemployed, and naturally they would become E.P.E.A. members. Of course, I am speaking for myself, but I should say my unemployed brothers would do the same. If the chief engineers and E.P.E.A. would go into this together, perhaps the E.P.E.A. would allow non-members to have a list of vacant appointments with a view to becoming members, when they are so fortunate as to obtain employment.

I shall be pleased if something can be done in this way to help the power station engineers who are still out of work.

Unemployed.

January 31st, 1927.

Legal.

The General Engineering Development Trust, Ltd.

MR. JUSTICE ROMER, in the Winding-up Court on February 1st, again had before him the petition of Walter Hill & Co., Ltd., for the compulsory winding up of this company, which is interested in the development of an electrical route indicator known as the "Pathfinder." It was said at the last hearing that the device was successful and in use at a number of places. Mr. SWORDS asked that the petition should be adjourned for eight weeks, as, he said, a scheme of arrangement was under consideration. His Lordship assented.

British Thomson-Houston Litigation.

IN the Chancery Division, on February 4th, Mr. Justice Astbury had before him a motion in the case of the British Thomson-Houston Co., Ltd., against Braidwood for an injunction to restrain the defendant from infringing plaintiffs' two patents relating to leading-in wires and gasfilled electric lamps.

Mr. B. L. O'MALLEY, for the defendant, said this was a very humble offence. His client was a small shopkeeper at Barnet.

His LORDSHIP: They generally are.

Counsel said he was willing that the motion should be treated as the trial of the action, and consent to the injunction. The defendant had had only six dozen of the infringing lamps, and there was no evidence this had been going on for any length of time.

His LORDSHIP: These defendants are all trying to humbug the plaintiffs.

The motion was treated as the trial of the action, and his Lordship granted a perpetual injunction with the usual costs, ordered delivery up of all infringing lamps in defendant's possession, and an inquiry as to damages unless the parties agreed on a sum.

MR. JUSTICE TOMLIN, in the Chancery Division, on February 4th, again had before him the motion by the B.T.-H. Co., Ltd., for an injunction restraining alleged infringements by J. G. Ritchie, trading as the West Yorkshire Electric Co., of Woodsley Road, Leeds, of plaintiffs' lamp patent. Mr. TREVOR WATSON, for the plaintiffs, said his Lordship had granted an *ex parte* injunction restraining the defendant from parting with possession of the alleged infringing lamps. He read an affidavit by Percy Freeman, who said he bought a dozen lamps at defendant's premises, Ritchie himself handing them to him and telling him that he had lamps of various voltages in stock, and he would be glad to supply him.

Mr. RITCHIE, who appeared in person, read an affidavit to the effect that not only had he not infringed the plaintiff company's patents by selling lamps, but that he never sold any lamps to their representative at all.

His LORDSHIP said this raised a serious issue of fact which he could not try on a motion.

Defendant said this was a serious matter for him, as it was holding up his living.

His LORDSHIP said he would grant facilities for an early trial of the issue, and in the meantime the interim injunction would drop.

Handcock v. Routledge.

ACCORDING to an Irish newspaper report, Mr. Justice Meredith recently delivered his reserved judgment in the case of Ernest C. Handcock, electrical engineer and commission agent, of Dublin, against Frederick Routledge, also of Dublin, on an application made by the plaintiff for an order for discovery of documents. The action was brought for an account of all orders placed with the defendant as agent for electrical house service meters made by the Dr. Paul Meyer, A.G., of Berlin, and for other electrical material manufactured by the Deutsche K.A. Gesellschaft, of Berlin, as a result of the work and canvassing of the plaintiff, directly or indirectly; an account of all commissions credited or paid to the defendant on account of all such orders, and payment of 50 per cent. of the commission. The plaintiff alleged that under an agreement of March, 1924, with the defendant he was to be paid, as agent, demonstrator and canvasser, 50 per cent. of the commission received by the defendant on all orders for such goods placed with him resulting from the plaintiff's work, directly or indirectly, or in any way influenced by the plaintiff during the continuance of the agreement to September 20th, 1925. The plaintiff had been advised that for the successful carrying on of his action it was essential to have discovery of the docu-

ments in the defendant's custody, as he had no documentary information on the subject. The defendant denied that the agreement mentioned was entered into or was in operation during the time specified, or at all.

Mr. JUSTICE MEREDITH stated that he was by no means satisfied that the question with reference to the rights of the plaintiff could be satisfactorily tried without discovery, and he accordingly made an order for discovery, limited to the period of the continuance of the agreement, as stated by the plaintiff from March, 1924, to September 20th, 1925 .

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1925.

507. "Electric motor starters." Igranic Electric Co., Ltd., and F. Bergmann. October 7th, 1925. (263,584.)

12,655. "Automatic telephone systems." Standard Telephones & Cables, Ltd. (G. Deakin, L. Polinkowsky, and W. Hatton. July 8th, 1925. (263,596.)

17,226. "Wireless signalling apparatus." Soc. Lerolle et Cie. July 5th, 1924. (236,587.)

22,465. "Electric switches." J. C. White. September 9th, 1925. (263,908.)

22,562. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). September 9th, 1925. (263,909.)

24,596. "Receiving systems for wireless telegraphy, telephony, and like purposes." R. H. Elleray. October 2nd, 1925. (263,918.)

24,628. "Picture transmission systems." Standard Telephones & Cables, Ltd. (Bell Telephone Laboratories, Inc.). October 2nd, 1925. (263,919.)

24,754. "Electric remote-control systems." Coventry Automatic Telephones, Ltd., and N. C. Smart October 5th, 1925. (263,926.)

24,810. "Apparatus for the reception of wireless signals." N. Lea and Radio Communication Co., Ltd. October 5th, 1925. (Addition to 240,899.) (263,931.)

24,885. "Dynamo-electric machines." English Electric Co., Ltd., J. C. Wilson, and J. W. Howard. October 6th, 1925. (Cognate application 4,686/26.) (263,940.)

25,010. "Spark plugs." A. Renaudin. October 8th, 1924. (241,204.)

25,011. "Self-exciting synchronous dynamos and motors." J. L. Matabon and C. M. Foucault. December 26th, 1924. (245,068.)

25,023. "Aerial systems for use in wireless telegraphy and telephony." C. S. Franklin. October 7th, 1925. (263,943.)

25,126. "Variable electric condensers." J. R. Spink and J. B. Langley. October 8th, 1925. (263,948.)

25,329. "Telephone transmitters." Standard Telephones & Cables, Ltd. (Bell Telephones Laboratories, Inc.). October 10th, 1925. (263,954.)

25,343. "Electromagnetic relays." British Thomson-Houston Co., Ltd., and E. L. E. Wheatcroft. October 10th, 1925. (263,956.)

25,346. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). October 10th, 1925. (Addition to 169,698, as modified by 195,928.) (263,958.)

25,420. "Electric switchgear." British Thomson-Houston Co., Ltd., H. Trencham, and C. W. Wood. October 12th, 1925. (263,960.)

25,504. "Means for the intermittent operation of electric circuits." F. G. Brettell (R. N. Gardner). October 13th, 1925. (263,961.)

25,567. "Telegraphy and telephony of the kind employing high-frequency oscillations." A. C. L. Turpain and Soc. des Etablissements Gaumont. October 13th, 1924. (241,237.)

25,903. "Electric transformers." British Thomson-Houston Co., Ltd., and J. G. Wellings. October 16th, 1925. (263,967.)

27,168. "Electrical signal lamps." J. A. Orange and Metropolitan-Vickers Electrical Co., Ltd. October 29th, 1925. (263,973.)

27,951. "Electric lamp bulbs." Edison Swan Electric Co., Ltd., and G. A. Percival. November 6th, 1925. (263,979.)

27,987. "Synchronising systems for interconnecting electric distribution circuits." British Thomson-Houston Co., Ltd. (General Electric Co.). November 6th, 1925. (263,980.)

29,391. "Electromagnetic change-over switch for wireless aerial circuits." G. S. Holland. November 21st, 1925. (263,990.)

29,671. "Wireless receiving apparatus." H. W. Cole. November 26th, 1925. (263,991.)

30,995. "Portable electric lamps." A. R. Willmott and A. R. Willmott and Co., Ltd. December 8th, 1925. (263,999.)

31,177. "High-frequency electric signalling systems." Wired Radio, Inc. May 19th, 1925. (252,317.)

32,043. "Electric distribution systems." British Thomson-Houston Co., Ltd., and H. W. C. Liddiard. December 18th, 1925. (264,006.)

17,779. "Means for and methods of electric power transmission." A. M. Taylor. July 11th, 1925. (Cognate applications 18,996/25, 22,189/25, and 23,593/25.) (Addition to 232,275.) (263,952.)

17,880. "Electric switching device for electric luminous advertisements." M. Lautner. July 13th, 1925. (264,195.)

18,133. "Electric power transmission." A. M. Taylor. July 10th, 1925. (Cognate application 451/26.) (264,196.)

23,227. "Electric storage batteries." C. E. Lincharger. September 17th, 1925. (264,205.)

23,466. "Electric switchgear." Anderson, Boyes & Co., Ltd., and H. H. Guthrie. June 14th, 1926. (264,206.)

25,162. "Wireless transmission." M. Kubierschky. October 8th, 1925. (264,209.)

25,208. "Method of winding air-spaced inductance coils." J. Craig. October 9th, 1925. (264,211.)

25,419. "Control of dynamo-electric machines." British Thomson-Houston Co., Ltd., and A. A. Pollock. October 12th, 1925. (264,215.)

25,444. "Apparatus for the rapid quenching of sparking between electrical conductors, produced by excessive voltage." M. Buchholz. October 11th, 1924. (241,230.)

25,463. "Electrically heated hot-plates and other electric heating devices." E. L. Wiegand Co. October 15th, 1924. (241,554.)

25,535. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). October 13th, 1925. (264,222.)

25,603. "Electric lighting and igniting apparatus for motor vehicles." K. A. Barenyi. October 13th, 1925. (264,228.)

25,610. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and F. Tench. October 13th, 1925. (Addition to 227,510.) (264,229.)

25,711. "Thermionic valves." G. Marconi and C. S. Franklin. October 14th, 1925. (264,234.)

25,727. "Electric remote control and indicating systems, and apparatus used therein." Standard Telephones and Cables, Ltd. (Bell Telephone Laboratories, Inc.). October 14th, 1925. (264,235.)

25,728. "Telephone systems." Standard Telephones and Cables, Ltd. (G. Deakin). October 14th, 1925. (264,236.)

25,784. "Frequency meters, wave-meters, and other measuring instruments for high-frequency electric oscillations, applicable to other wireless apparatus." J. R. Im Thurn and L. S. B. Alder. October 15th, 1925. (264,239.)

25,845. "Electric fuse-boxes." F. W. Abbott. October 16th, 1925. (264,243.)

26,001. "Electrical transformers and like devices for transferring energy from one circuit to another." Secret Wireless, Ltd., and J. D. Chisholm. October 17th, 1925. (264,251.)

26,014. "Draw-out type electric switchgear." G. Pailin and Ferguson, Pailin, Ltd. October 17th, 1925. (264,252.)

26,504. "Process of introducing potassium or caesium or rubidium into electric discharge tubes." H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). October 22nd, 1925. (Cognate application 1,693/26.) (264,258.)

26,936. "Electrical circuit-interrupters." P. L. Harlow and Metropolitan-Vickers Electrical Co., Ltd. October 27th, 1925. (263,217.)

27,198. "Switching mechanisms for automatic telephone systems and the like." Siemens Bros. & Co., Ltd., and A. E. Caswell. October 29th, 1925. (264,268.)

27,388. "Crystal apparatus for use in connection with electric oscillations." J. Wilcockson and H. W. Roberts. October 31st, 1925. (264,270.)

29,066. "Method and means for communicating with submarines especially and for wireless communication generally." Q. C. A. Craufurd. November 18th, 1925. (264,281.)

29,513. "Accumulator cells." J. Stone & Co., Ltd., and A. H. Darker. November 23rd, 1925. (264,284.)

30,096. "Electrical switchgear." D. R. Davies and Metropolitan-Vickers Electrical Co., Ltd. November 28th, 1925. (264,291.)

30,349. "Electrically-illuminated advertising apparatus, and control devices therefor." Scintillating Sign Co., Ltd., and C. E. H. Fitch. December 1st, 1925. (264,292.)

31,935. "Electric heaters." J. Stone & Co., Ltd., and C. D. Skinner. December 17th, 1925. (264,296.)

32,151. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and W. G. Patterson. December 19th, 1925. (263,306.)

32,716. "Electric fuses." E. Dobson. December 28th, 1925. (264,306.)

1926.

1,440. "Electric switches." Hart Manufacturing Co. January 17th, 1925. (246,178.)

1,445. "Thermionic valves for wireless sets." W. H. Murad. January 18th, 1926. (264,016.)

1,560. "Method of generating high frequency three-phase currents." C. Lorenz Akt.-Ges. February 23rd, 1925. (247,925.)

1,821. "Attachments for electric pocket-lamps for the purpose of exhibiting opaque objects." R. W. Law and H. H. Uphill. January 22nd, 1926. (264,019.)

2,639. "Electric heating elements." General Electric Co., Ltd., A. Kinnes, and M. H. Hunt. January 29th, 1926. (264,023.)

2,676. "Duplex method for telegraph cables." Dr. H. W. G. Salinger. February 10th, 1925. (247,545.)

3,040. "Apparatus for examining electric sparks and their effects." G. Loutz and E. H. S. Sinclair. June 12th, 1925. (253,479.)

4,316. "Braking systems for electric motors." British Thomson-Houston Co., Ltd. February 14th, 1925. (247,607.)

4,321. "Headlights for road vehicles." G. P. M. Henrion. March 12th, 1925. (249,087.)

4,343. "Thermionic valves for wireless reception or transmission." R. L. Howard Flanders. February 16th, 1926. (264,031.)

5,354. "Lead-in devices for wireless apparatus." P. Elphick. February 25th, 1926. (264,037.)

8,113. "Photometers." H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). March 24th, 1926. (264,039.)

11,555. "Alternating-current rectifiers." E. R. Gill. May 1st, 1926. (264,051.)

11,556. "Means for rectifying alternating currents." E. R. Gill. May 1st, 1926. (264,052.)

11,643. "Electric cables" Pirelli & Co. May 4th, 1925. (251,670.)

11,671. "Hollow-stranded conductors for electric high-tension overhead lines." E. C. R. Marks (Felten & Guilleaume Carlswerk Akt.-Ges.). May 3rd, 1926. (264,053.)

11,677. "Double-range voltmeters." Weston Electrical Instrument Corporation. August 26th, 1925. (257,572.)

11,869. "Electric meters." International General Electric Co., Ltd. May 13th, 1925. (252,154.)

11,954. "Regulating systems for dynamo-electric machines." British Thomson-Houston Co., Ltd. May 9th, 1925. (252,010.)

13,038. "Phonograph adjunct for radio sets." Marconi's Wireless Telegraph Co., Ltd. June 2nd, 1925. (253,096.)

14,856. "Apparatus for feeding oil to high-tension cables." Pirelli & Co. July 11th, 1925. (255,034.)

17,031. "Electrode structures for thermionic devices." British Thomson-Houston Co. July 8th, 1925. (255,069.)

17,380. "Starting and regulating devices for single-phase-fed induction motors." F. Krupp Akt.-Ges. August 25th, 1925. (257,580.)

17,412. "Alternating-current electro magnets." British Thomson-Houston Co., Ltd. July 10th, 1925. (255,105.)

17,473. "Automatic winding devices for electric or other cables, cords, or the like." W. H. Sturge. July 13th, 1926. (264,075.)

19,021. "Circuit protection." British Thomson-Houston Co., Ltd. August 20th, 1925. (257,246.)

24,061. "Sound-reproducing devices." British Thomson-Houston Co., Ltd. July 26th, 1926. (264,103.)

26,889. "Incandescent electric lamps." Y. Sakakura. November 11th, 1925. (261,358.)

924. "Time switches." G. Colledge. January 12th, 1926. (264,317.)

1,210. "Electric accumulators." W. Haddan. January 15th, 1926. (264,318.)

1,309. "Holders for gas globes, electric light shades, reflectors, and the like." A. C. Peak. January 18th, 1926. (264,319.)

1,628. "Lighting arrangements for road vehicles." W. A. Wyllie. January 20th, 1926. (264,323.)

1,736. "Brush holders for dynamo-electric machines." English Electric Co., Ltd., and E. H. H. Hassler. January 21st, 1926. (263,321.)

2,625. "Wireless receiving apparatus." S. L. Forbes. January 29th, 1926. (264,332.)

5,575. "Electrical earthing connections and the like." J. P. Laker. February 27th, 1926. (Cognate application 27,203/26.) (264,349.)

5,983. "Method of and means for assisting in the construction of wireless sets and apparatus." A. Barringer. March 3rd, 1926. (263,395.)

6,130. "Electric traction." Soc. Technique d'Etudes et d'Entreprises pour l'Industrie and A. Huguenin. May 27th, 1925. (252,675.)

6,709. "Bases for current-collectors for electric railways." J. de Fischer. March 10th, 1926. (264,358.)

7,191. "Manufacture of electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 28th, 1925. (249,847.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from February 2nd :—

Metco. No. 476,208. Class 8. Electric cables.—Metropolitan Electric Cable and Construction Co., Ltd., Fuller Works, Grove Road, Chadwell Heath, Essex.

Electricon. No. 473,600. Class 13 Plugs, sockets, switches, connectors, and screws.—Barnard Alfred Spaull, trading as Barnard A. Spaull, 62, Fore Street, London, E.C.2.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Inclusion in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ALFRETON.—Housing scheme (54), for the U.D.C.; surveyor, King Street.

ASHTON-UNDER-LYNE.—Housing scheme (92), Oakfold Estate, for the T.C.; J. Rowbottom, borough surveyor.

BARNES.—Conversion of Barnes Theatre into a kinema; the Palaseum Co.

BEBINGTON.—Housing scheme (218), Stanton Estate, for the U.D.C.; surveyor.

BECKENHAM.—Extension, Cottage Hospital; governors.

BILSTON (WOLVERHAMPTON).—Additional housing schemes (178), for the U.D.C.; F. B. Sidwick, surveyor.

BINLEY.—Housing scheme (150), Binley Colliery Co., schools, for Warwickshire E.C.; director of education, Warwick.

BIRKENHEAD.—Offices for Water Department of Corporation; Collin & Son.

BIRMINGHAM.—164 houses, Acocks Green; H. Boot & Sons, Ltd. 118 houses, Hall Green, 862 at Tyseley Farm; Edwards (Birmingham), Ltd.

BLACKBURN.—Extension of the Technical College; school at Roe Park and proposed schools at Intack Mill Hill and Audley; director of education.

BLACKPOOL.—Housing schemes, Layton, St. John's Estate and Bispham (155); borough engineer.

BOLTON.—118 houses, Higher Swan Lane and 312 at Moorfield estate; borough engineer.

BROADSTAIRS.—Residence, North Foreland (£100,000), for Sir Edmund Vestey.

BROMLEY (KENT).—Additional 94 houses, for the R.D.C.; L. O. Wall, clerk, Church House.

BROWNHILLS (STAFFS.).—Housing scheme (100), for the U.D.C.; surveyor.

BURSLEM.—500 houses, Holden Hill; Stoke city engineer.

CAERPHILLY.—Houses (50), Senghenydd site, for the U.D.C.; A. J. Rossiter, builder. Mining institute, for Glamorganshire E.C.; Davies & Lloyd, builders.

CAMBERLEY.—Secondary schools (£24,000), for Surrey E.C.; W. W. Finny, secretary, Kingston-on-Thames.

CANADA.—Canadian company is making additions to office buildings over a period of five years ($6,000,000); manufacturers of electric motors, switchgear, pumps and motors, boiler equipment, piping, &c., can obtain particulars from the Department of Overseas Trade, 35, Old Queen Street, S.W. (CX 2190.)

CARSHALTON.—Houses (99), for Sawyers & Co. Houses (64), Carshalton Place, for Tysoe & Harris. Housing scheme (166), Stanley Road, for the U.D.C.; Hugh Macintosh, architect.

CHERTSEY.—Additional housing scheme (200), for the U.D.C.; surveyor.

CHRISTCHURCH (HANTS).—Development of Homelands Estate, with 70 houses; Curry, Ltd.

COVENTRY.—Hospital extensions, for the B.G.; the clerk.

DUMFRIES.—Cold storage factory; J. Henderson, solicitor. Extension of premises for Magneto Accumulator and Electro-Plating Co., Leafield Road; the manager.

DUNFERMLINE.—Operating theatre, orthopædic, X-ray, &c., department and heating installation at the Dunfermline and West Fife Hospital; Hospital Board.

FALKIRK.—Omnibus garage and shop (£2,800) for Walter Alexander & Sons, Camelon; the manager.

GLASGOW.—Reconstruction scheme, Wellington Arcade; Smith (Glasgow) Ltd. Students' Union in University Avenue; Mr. J. K. Hunter, Ayr, assessor of plans. Schools (£300,000); clerk, Education Authority, Bath Street.

GRAVESEND.—192 houses, Kings Farm; J. G. Bennett, Corporation architect.

HEBDEN BRIDGE.—Refuse destructor; surveyor to the Council.

HEMEL HEMPSTEAD.—Extensions, West Herts Hospital; H. Fletcher, secretary.

HIGH WYCOMBE.—Chair factory, Dashwood Avenue, for Worley Bros. & Co. Housing scheme (102), West End, for the T.C.; T. J. Rushbrooke, borough surveyor.

HOCKERGATE.—Secondary school, Townley Estate; Durham County Education Committee.

HULL.—Extensions, Grammar School; Holliday & Barker.

LEOMINSTER.—Senior schools (£9,000), for Herefordshire E.C.; director of education, Hereford.

LEEDS.—X-ray installation, Tuberculosis Dispensary; chief clinical tuberculosis officer of the Corporation. Workshops and offices for Corporation Gas Department, New York Road (£110,000); G. W. Atkinson, architect. 750 houses, York and Seloy Estates; city architect. Motor-'bus garage, Goodman Street and Donisthorpe Street; city engineer.

LIGHTWOOD (STAFFS.).—Shopping centre, Stone Road; Beckett & Bloore, architects.

LITHERLAND.—Central school; Lancashire Education Committee.

LONDON (L.C.C.).—Electric light installation at the following schools: Holland Road, Brixton; Britannia Road, Fulham; Highbury Hill, Highbury; Brecknock School, Highgate; Springfield School, Kennington; Sirdar Road, Kensington; Carmac Street, Norwood; Bromley Hall Road; Upper North Street, and Janet Street, Poplar; Magdalen Road, Wandsworth; L.C.C. Education Committee.

(ILFORD, E.).—300 houses, Springfield Drive Estate; Suburban Developments, Ltd.

(E.C.).—Proposed improvements to the Guildhall (£250,000); City Corporation.

(DEPTFORD, S.E.).—Reconstruction of premises, High Street, for Selfridge & Co., Ltd.

(LEWISHAM, S.E.).—Additional 128 houses, Grove Park, for the T.C.; borough surveyor.

(PECKHAM, S.E.).—Reconstruction Crown Cinema, High Street, Biocolot, Ltd.; architect, E. A. Stone.

(SOUTHWARK, S.E.).—Building on Stamford Street site; G. Hamblin Fox, 34, Crutched Friars, E.C.

(HOLBORN, W.C.).—Reconstruction of warehouses, Cockpit Yard, Holborn; Welch & Hollis.

LUTON (BEDS.).—Extensions, Bute Hospital (£18,500), for the Board of Management; secretary.

MACCLESFIELD.—Extensions, Westpark Hospital, for the B.G.; Whittaker & Bradburn, architects, 19, King Edward Street.

MALDENS & COOMBE (SURREY).—76 flats, Thorne Road site, for the U.D.C.; R. H. Jeffes, architect, New Malden.

MANCHESTER.—Extension of Exhibition Hall, Liverpool Road; city architect, Town Hall.

MELTON MOWBRAY.—Senior boys' school (£13,000), for Leicestershire E.C.; director of education, Leicester.

MIDDLETON.—Housing scheme (158), Boarshaw Estate; J. H. Randall, Ltd., builders, Sheffield.

NEWARK.—Technical institute, Notts Education Committee.

NEWBURY (BERKS).—Roman Catholic church (£16,000); Wilfred C. Mangan, architect, Preston. Hoskings Bros., builders.

NORTHAMPTON.—84 houses, Weedon Road; borough engineer.

PLYMOUTH.—208 houses, Higher Mount Gold Estate (£100,000), for the T.C.; J. Wibberley, borough surveyor.

RAWMARSH (YORKS).—104 houses, Clay Pit Lane site; J. A. Tonge, architect, Council Offices, Parkgate, Yorks. Kinema, High Street, for the Heeley Amalgamated Cinemas, Ltd.

ST. ALBANS.—Central boiler station for heating institution (£10,000), for the B.G.; the clerk.

ST. HELENS.—Tuberculosis dispensary, Hardshaw Street; Lancashire C.C.

SALFORD.—Maternity home and welfare centre, Landseer Street; city engineer.

SALISBURY.—90 houses, Stratford Road; borough engineer.

SEISDON.—Additional 58 houses, for the R.D.C.; surveyor.

SHEFFIELD.—Corporation houses, Longley Estate (111); S. Higton & Son, 30 houses; M. J. Gleeson, Ltd., 63 houses; W. C. W. Alflat, 18 houses.

SURBITON.—Combined dispensary, welfare centre, and school clinic, South Place; Surrey C.C.

WALLINGTON (SURREY).—Houses (39), Coldharbour Estate, for T. Markwick & Co. Housing scheme (114), Bute Road, for the U.D.C.; surveyor.

WARSOP.—Additional 103 houses, with electrical work, Church Warsop, for the Staveley Coal & Iron Co., Ltd.; Structural Contractors, Ltd., builders, Victoria Street, London.

WARWICK.—Heating and lighting services, Hatton mental home (£35,638), for Warwickshire C.C.

WHISTON.—Schools (£28,200), for Lancs. E.C.; director of education, Preston.

WHITEFIELD.—Secondary school for girls; Lancashire Education Committee.

YORK.—Houses (80), for the T.C.; A. V. Clerey, builder, Sunderland.